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AN ANALYSIS OF THE MARKET FOR COPYING
AND DUPLICATING EQUIPMENT IN SECONDARY SCHOOLS

by



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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF BUSINESS ADMINISTRATION

FACULTY OF BUSINESS ADMINISTRATION AND COMMERCE

EDMONTON, ALBERTA

SPRING, 1971

UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "An Analysis of the Market for Copying and Duplicating Equipment in Secondary Schools," submitted by Neil Donald Manning in partial fulfilment of the requirements for the degree of Master of Business Administration.

ABSTRACT

This study examines the nature and capabilities of the market analysis technique of market research. The technique is then applied to the evaluation of the market for the copying and duplicating products of Xerox of Canada Limited in the secondary schools of the Edmonton School District.

The market analysis describes the products presently available, as well as their advantages and limitations in relation to the requirements of this market segment. It also considers the existing characteristics of the schools and the teaching and administrative practices present in the market, as well as the trends which are expected to develop in the future. This provides an evaluation of the present requirements and the general effect which projected developments will have on the future usage of copying and duplicating equipment in the market.

This study also contains an empirical analysis of the expected future requirements for copying and duplicating equipment within individual schools in the market. This is based on a market survey of a sample containing schools considered to be representative of the trends expected to be implemented in all schools within this market. This analysis evaluates the relative costs of the various methods under these conditions, and determines the competitive position of the Xerox product in relation to the other technique.

The market analysis recommends that further analysis be given to the development of a more competitive pricing policy, and a vertical marketing approach to this segment. However it is realized that prior to implementing these recommendations, this study must be replicated in other major regional markets to verify its findings.

ACKNOWLEDGEMENT

The writer wishes to express his sincere appreciation to Dr. C.A. Lee, supervisor of the thesis, for his advice and guidance during its preparation. Gratitude is also expressed to committee members Dr. J. D. Muir and Dr. M. D. Stewart.

The writer also wishes to thank Mr. D. B. Fitz of Xerox of Canada Limited, for his help in the selection of the thesis topic. The assistance and support of many other individuals in this firm is also gratefully acknowledged.

Finally, appreciation is also expressed to the officials of both school boards in the Edmonton School District for the information and counsel they provided.

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CHAPTER I

INTRODUCTION

This thesis will illustrate the value that the market analysis technique of market research has to a firm considering expansion into new markets. The study will apply the market analysis technique to a potential market segment for a firm and develop conclusions and recommendations regarding its value. These conclusions will then be used to illustrate the benefit which the market analysis technique provides to the particular firm involved, as well as the implications for other areas.

THE ROLE OF MARKET RESEARCH

Crisp has defined market research as the systematic and objective search for, and evaluation of information which is relevant to any problem in the field of marketing.¹ It encompasses research activities in three broad areas of marketing; research on products and services, markets, and sales methods and policies. Market research is based upon the concepts and characteristics of the scientific method, although it may not meet the rigorous requirements of the method as used in the physical sciences.

The role of market research may be best defined by an analysis of the marketing functions with which it interacts.

¹ Richard D. Crisp, Marketing Research (New York: McGraw-Hill Inc., 1957), p. 3.

Marketing management is concerned with the recognition and solution of complex problems which arise when uncertainty exists with respect to the achievement of an objective. The decision-making process involved in the analysis of such problems contains three phases; the delineation of possible actions, prediction of the resultant impacts, and assessment of the order of preference of predicted results.² Marketing research is a tool capable of fulfilling the requirements of the first two phases of this process, where information and data concerning the condition and nature of the problem are needed.³

However, the benefit of marketing research to firms also extends beyond the improvement of isolated marketing decisions. For as solutions to problems are obtained, they may possibly be generalized to like situations. Even if a solution may not be adapted to changed circumstances, it may provide other improvements. It may upgrade the information base on which further constructive analysis must rest, or the approach to problem-solving situations. Therefore, the overall value of market research is its ability to improve the logical and factual foundations of decisions within the firm such that substantial confidence may be placed in them.⁴

² Hiram C. Barksdale, and William M. Weilbacher, Marketing Research (New York: The Ronald Press Co., 1966), p. 18.

³ John P. Alevizos, Marketing Research (Englewood Cliffs: Prentice-Hall Inc., 1961), p. 5.

⁴ Lyndon O. Brown, and Leland L. Beik, Marketing Research and Analysis (New York: The Ronald Press Co., 1969), p. 11.

THE MARKET ANALYSIS METHOD

The particular area of market research in which this study is concerned is the broad category previously referred to as market analysis. This type of research is typically used to develop a quantitative evaluation of the market opportunity for a product, based on the consideration of a wide variety of information sources. It is concerned with an analysis of all the external factors which can affect the sale of the products of an organization. Generally such factors cannot be controlled by the firm, and this method considers how these variables will influence its marketing decisions.⁵ Market analysis is considered to be one of the most important areas of market research. This is due to the increasing emphasis being placed on the development of new markets and the further penetration of existing ones. The type of information provided by this method generally encompasses the following areas.

1. Current sales potential, which is the total of the actual sales of a product in the market segment by all firms in the industry.
2. Market trend studies concerned with the analysis of trends within the market for a given product.
3. Sales forecasts which project the probable sales for the total market as well as for individual firms within the industry.

⁵ William A. King, Quantitative Analysis for Marketing Management (New York: McGraw-Hill Inc., 1967), p. 167.

4. Relative market potential, which compares the fertility of the market segment under consideration to those in which the firm currently functions.⁶

THE MARKET ANALYSIS STUDY

In order to illustrate the value of the market analysis technique, it is used in the analysis of a potential market for a particular company. The firm selected for this study is Xerox of Canada Limited. The potential market segment for this firm which has been chosen for analysis is the market for copying and duplicating equipment in junior and senior high schools. The study provides a description of the size and potential growth of the market, and the critical variables associated with these characteristics. This is followed by an evaluation of the factors considered and the formulation of conclusions and recommendations relating to the potential of the market segment.

Scope Of The Study

A preliminary study in conjunction with the market analysis has indicated that the following factors associated with this market segment require consideration in order to provide a proper evaluation of its potential.

⁶ David J. Luck, Hugh G. Wales, and Donald A. Taylor, Marketing Research (Englewood Cliffs: Prentice-Hall Inc., 1961), p. 18.

1. The copying and duplicating products currently competing in the market, and their relative capabilities and costs.
2. The existing size and characteristics of the market, and its demand for copying and duplicating equipment and supplies.
3. The planned growth and expansion of the market, and the projected changes in the future demand for copying and duplicating equipment.
4. An evaluation of the characteristics associated with the copying and duplicating requirements in individual schools to determine the most appropriate methods.

The information relevant to the above factors is primarily obtained from secondary data sources. The only exception involves the measurement of the requirements in individual schools, since this information can only be derived through primary data collection. Each of the above factors will be evaluated in turn throughout the market analysis study.

Limitations Of The Study

The limitations of this study primarily relate to shortcomings in the market analysis project. The major restriction involves the extent to which its findings are representative of the total market segment in Canada. Due to the detailed nature of the above information requirements, as well as the physical and time restrictions, it is necessary to limit the geographical scope of

this study. Therefore, this market analysis takes the form of a pilot study limited to the regional market area of the Edmonton School District.

A second limitation of the study is in the area of the primary data analysis of individual school requirements. The detailed characteristics of the information required on copying and duplicating equipment usage has influenced the use of the market survey approach. While there may be restrictions with respect to the rate of response achieved by this method, it is felt that it is the most acceptable technique under these conditions.

Finally, the preliminary analysis prior to the selection of the sample for this survey has indicated that the market is differentiated. This is primarily due to variations caused by new developments in teaching and administrative practices being initiated in various schools in the system. To ensure that the market survey focussed on projected conditions, a non-probability technique was used in the sample selection to guarantee that the schools studied had already implemented these developments. Therefore, this sample is only representative of the schools which are currently utilizing the developments in teaching and administrative practices which are expected to be implemented in all schools throughout both school systems.

The above limitations indicate that this firm must consider the recommendations of this study in the proper perspective. Prior to implementing any of these recommendations, it would first

have to replicate this study in other major regional markets to verify its findings with respect to the characteristics of the market and its equipment usage. However, despite these restrictions the study provides some meaningful conclusions, and illustrates the value of the market analysis technique to a firm considering an expansion into new markets.

CHAPTER II

EXISTING COPYING AND DUPLICATING PRODUCTS

INTRODUCTION

This study initially analyzes the type of copying and duplicating processes which are currently being used in this market, and their respective characteristics and capabilities. This evaluation is required since the limitations of some processes, combined with the unique requirements of this market, have resulted in all methods not being equally competitive. The products currently being marketed in each process, together with their characteristics and costs, are provided in accompanying tables to illustrate the degree of product differentiation which exists. An analysis is also made of the characteristics of the Xerographic process and its products. This is to illustrate the competitive position which these products could maintain in relation to the copying and duplicating equipment currently available in this market.

COPYING PROCESSES

The various methods within the copying processes are designed to produce a limited number of copies from originals which are already in a form for direct reproduction. This process is oriented towards producing copies from materials such as; documents, books, drawings, and half-tone and line illustrations which cannot be copied by other methods. It may also be used as an intermediate step in the duplicating process, since an original document may be

copied onto the masters which are used in this method.¹

The Thermographic Process

The Thermographic process is a single-step dry method, requiring no intermediate master, translucencies, or chemicals. The process places the original and the heat-sensitive copy paper in contact with an infra-red light source. The text of the original re-radiates the heat such that it forms an image on the corresponding areas on the copy paper.²

The advantages of this process are its simple operation and ability to copy from or onto a wide variety of materials. Copies can be produced from virtually any type of original; whether opaque, transparent, translucent, printed on both sides, or containing a half-tone image. The process can also produce copies onto various weights of sensitized papers; special stencil and spirit masters; black or colored transparencies; and gummed or perforated paper.³

However, the Thermographic process has several limitations due to its particular method of reproduction. The primary disadvantage is that it can only copy documents which contain a carbon substance. This severely limits the process with respect to the types of originals from which it can produce copies. The copies also retain a sensitivity to heat, and must be protected from any heat or strong

¹ H.R. Verry, Document Copying and Reproduction Processes (London: Fountain Press Ltd., 1960), p. 39.

² William R. Hawken, Copying Methods Manual (Chicago: American Library Association, 1966), p. 129.

³ Donald Mason, Document Reproduction in Libraries (London: St. Ann's Press, 1968), p. 49.

light to avoid deterioration. Finally, most types of equipment utilizing this process do not have an automatic exposure time adjustment. Under continuous use the exposure time is reduced, and a manual adjustment of this control is required to ensure acceptable copy quality. The result of this continuous adjustment typically is a high degree of wastage.⁴

The Dual-Spectrum Process

The Dual-Spectrum process of document reproduction has been developed as an improvement to the Thermographic copying process. It uses an additional light source to form a latent image of the original on an intermediate sheet, which is then transferred onto the copy paper through the use of an infra-red light source. The major improvement of this process over the previous method is its ability to copy from any type or form of original.⁵

However, the Dual-Spectrum process contains limitations which are similar to those outlined for the Thermographic process. The intermediate sheet is light sensitive, and the copy paper heat-sensitive, and both require protection to avoid deterioration. The process is also quite restricted in that it cannot produce copies onto spirit, stencil, and offset masters. Finally, the copying equipment associated with this process lack an automatic exposure adjustment. This means that in order to copy from various colored

⁴ Ibid., p. 49.

⁵ William R. Hawken, Copying Methods Manual (Chicago: American Library Association, 1966), p. 177.

originals, a manual adjustment is required to ensure adequate quality, and this typically results in a high degree of wastage.⁶

The Electrofax Process

The Electrofax process can only produce copies onto materials with a coating of the photo-conductive material zinc oxide. In the copying process the copy paper is given a charge making it light sensitive, and then exposed to light reflected off the original document. This light dissipates the charge on the paper in all areas except those corresponding to the text of the document, producing a latent image of the original. A black substance, in a liquid or powder form, with an opposite charge is then placed in contact with the paper, and adheres to the charged areas producing a visible image. The image is then affixed to the copy paper through the application of heat or evaporation.

The advantages of the Electrofax process are that the copies and supplies are not sensitive to heat or light, and that it can produce copies directly onto offset masters. However, this process has several limitations due to its particular method of reproduction. The copy paper is relatively thin, brittle, and easily marred, and the weight of the zinc oxide coating makes it considerably heavier than that used in other processes. This process can only produce copies onto the normal copying paper, translucent papers, and offset masters which contain this coating. The copies typically have a low contrast,

⁶ Ibid., p. 162.

short tone range, and are inconsistent in quality. However, some manufacturers using this process do produce material with greater contrast and density, and a better reproduction of solid areas.⁷ This process is also limited by the presence of a manual exposure adjustment, and this generally leads to a high degree of wastage.

A Comparison of the Copying Processes

The analysis of the various copying processes and their products available in the market indicates that they have a variety of different capabilities and limitations [Table 1]. The products using the Thermographic process are among the most economical in the market, and are designed for situations with low usage requirements. However, they lack versatility since the original must be of a specific size since it passes through the machine, and they cannot produce multiple copies automatically. However, the advantages of the equipment are that it can produce copies onto spirit and stencil masters as well as transparencies.

The products associated with the Dual-Spectrum process are more restricted in their capabilities. While this equipment is economical, and can copy from three-dimensional objects as well as produce transparencies; it can only produce single copies, and more critically, it cannot copy onto the masters for any duplicating process. These two limitations restrict the value of this equipment to situations with low usage document copying requirements, which are very limited in this market.

⁷ Ibid., p. 162.

TABLE I

COPYING EQUIPMENT IN THE MARKET

MANUFACTURER	MODEL	SINGLE (X) OR MULT. COPY TO	COPIES FROM THREE DIMENSIONAL OBJECTS	COPIES ONTO SPIRIT AND STENCIL MASTERS	COPIES ONTO OFFSET MASTERS
<u>THERMOGRAPHIC:</u>					
Minnesota Mining & Mfg.	96	X		X	
	45C	X		X	
Photofax Products	Fordifax	X		X	
Gestetner	TH-4	X		X	
<u>DUAL-SPECTRUM:</u>					
Minnesota Mining & Mfg.	107	X	X		
<u>ELECTROFAX:</u>					
Smith-Corona Marchant	88	10		X	
Scott Paper Products	3-D	15		X	
C.B.C.	1	15		X	
Savin	220	15	X	X	
A.B. Dick Co.	675	15	X	X	
Remington Rand	Flomatic	15		X	

TABLE 1 -- Continued

MANUFACTURER	MODEL	MANUAL EXPOSURE CONTROL	PRODUCES TRANSPARENCIES	SPEED PER HOUR	TENDER COST ^a
<u>THERMOGRAPHIC:</u>					
Minnesota Mining & Mfg.	96	X	X	600	\$ 212.49
	45C	X	X	900	379.15
Photofax Products	Fordifax	X	X	600	240.00 ^b
Gestetner	TH-4	X	X	900	337.50
<u>DUAL-SPECTRUM:</u>					
Minnesota Mining & Mfg.	107	X	X	N/A	331.66 ^b
<u>ELECTROFAX:</u>					
Smith-Corona Marchant	88	X		900	765.00
Scott Paper Products	3-D	X		600	1,162.00
C.B.C.	1	X		600	1,350.00
Savin	220	X		600	1,375.00 ^b
A.B. Dick Co.	675	X		600	1,410.35 ^b
Remington Rand	Flomatic	X		800	995.00

^a Derived from the 1970 Tender Cost

^b This model was awarded the tender for this particular process

Source: "Copiers '70: New Processes and Capabilities", Administrative Management, Vol. XXX No. 12 (December, 1969), p. 48 and the Edmonton Public School Board tenders for 1970.

The products in this market using the Electrofax process are significantly more expensive than the previous methods; but they are capable of accommodating higher volume workloads. They can also produce multiple copies automatically, copy from three-dimensional objects, and produce offset masters. However, these products are limited in that they cannot produce copies onto spirit or stencil masters, nor transparencies.

This analysis has also illustrated that the products of the above processes which are present in this market are hampered by two common limitations. All the products are based on the use of a sensitized type of copy paper in the process, and this limits the usage of their output in many respects. Similarly, these products all contain a manual exposure adjustment which requires continual adjustment when copying various types of originals. These restrictions limit the ability of these products to accommodate the requirements of this market.

DUPLICATING PROCESSES

The various duplicating methods are designed to produce large numbers of multiple copies and meet entirely different requirements than the copying process. The different types of duplicating methods are the Spirit, Stencil, and Offset techniques. The only characteristic which these processes have in common is that they all produce copies from a master containing the image to be produced. The characteristics and limitations for each of the above processes will be outlined in the following analysis.

The Spirit Duplicating Process

The Spirit duplicating process uses a master consisting of a special glazed paper with a carbon backing sheet. These masters may be prepared by typing or drawing, and by the photographic or thermographic copying methods. When an image is formed through one of these processes, a reverse carbon deposit is transferred onto the back of the master sheet.

In the duplicating process the master is attached to a drum within the equipment with the reverse side protruding. The copy paper is then moistened with solvent, and put in contact with the master. This causes a thin layer of the carbon image on the master to adhere to the paper, and both materials dry rapidly to produce the copy.⁸

The major advantage of the Spirit duplicating process is its economical nature. The equipment and the masters are the least expensive of any process, and the only other expendable supply required is a solvent solution. Furthermore, the masters may be re-used if they retain a sufficient carbon image. This process is also very versatile in the area of colored reproduction. By using different colored carbon papers sequentially with one master sheet, it is possible to produce multi-colored copies with only one printing. Other processes typically require a separate re-inking procedure and duplicating run for each color added to the initial copy, which is much more time consuming.

⁸ Ibid., p. 201.

The primary disadvantage of this process is that the master life is limited because the carbon deposit is reduced with each copy produced. The process can only produce a maximum run length of between 150 and 500 copies from each master, depending upon the type of carbon master used. The quality of the copies is also inferior to other methods, and their durability is poor since the image fades when exposed to strong light. Finally, extreme operator care is required during both the master preparation and duplicating procedure to avoid carbon stains.⁹

The Stencil Duplicating Process

The Stencil duplicating process is based upon the principle of passing ink through images which have been cut into the stencil master, and onto the copy paper. The stencil consists of three parts; a strong fibrous sheet which is impervious to ink, a backing sheet, and a carbon sheet placed between them. An image of the text or drawing is placed on the stencil by cutting the protective fibrous sheet so that ink can flow through to form an image. The most common methods of stencil preparation are by typewriter, stylus, electronic scanning mechanism, or the Thermographic copying process.

In the duplicating process the fibrous sheet is placed around a perforated metal cylinder containing ink. The paper is then placed under the drum, and the ink is transferred by pressure through the image perforations in the stencil and onto the copy paper. This

⁹ Philip S. Pargeter, The Reproduction of Catalogue Cards (London: Staples Printers Ltd., 1960), p. 17.

process produces copies of higher quality and durability than the Spirit method; due to the type of stencil used, and the permanent nature of the ink.

The Stencil duplicating process is more aligned to the production of long-run lengths from each master and heavier work loads; due to the capabilities of the supplies and equipment available. The average stencil can produce up to 3,000 copies before deteriorating, and may also be stored for future use. The equipment is also more flexible and capable of producing higher levels of output than other methods. Additional factors influencing this focus are the comparatively higher initial costs of the masters and other supplies, the more extensive preparation time required by this process, and higher equipment costs. These cost factors must be apportioned to each impression made in a given duplicating run. Therefore, it is only in the long-run length and heavy workload situations that this process becomes economical.

The Offset Duplicating Process

The masters used in the Offset duplicating process are direct-image in nature, and vary from the inexpensive paper and vinyl types to metal plates. The run length capabilities of the masters fluctuate with the different types: vinyl masters are capable of up to 750 copies, paper masters 5,000 copies and the metal masters from 40,000 to 50,000 copies. The masters can also be stored for future use with minimal maintenance required. The most common methods of preparing the masters are by typewriter, all type of copying processes, and by

photographic techniques.

In the duplicating process the master is attached to a drum and water is repeatedly applied to it, which is repelled in the grease-based image areas. Printing ink is then introduced, and it adheres to the image on the master for which it has an affinity. This image is then transferred, or offset, onto an intermediate roller, forming a reverse image which is then transferred to the copy paper in the form of a normal image.

The Offset duplicating process produces copies of higher quality than any other method. The type of master used, and the variety of methods by which it may be prepared, also provides it with greater versatility than other processes. The Offset technique is also more aligned to the production of long-run lengths from each master, and heavy workloads than any other method. This is primarily due to the capabilities of the masters and the equipment. However, it is also influenced by the comparatively higher costs of supplies, the more extensive labour time required, and the higher equipment costs which must be apportioned over each impression produced. These costs make the Offset process relatively uneconomical for short-run duplicating work, and more practical in the long-run length, and heavy workload situations.

A Comparison of the Duplicating Processes

The analysis of the various duplicating processes and their products available in the market indicates that each method contains a variety of different capabilities and limitations. The Spirit

duplicating process is the most economical method, and its level of productivity is equivalent to other methods [Table 2]. However it is restricted by the limited life of the master, and the inferior quality and durability of the copies. Therefore, this process is designed for short-run length duplicating situations, where quality is not an important criteria.

The Stencil duplicating process is more flexible, and produces a better quality output than the Spirit technique. It is suited to the production of long run-lengths and heavy workloads; due to the capabilities of the supplies and equipment, but also the higher costs which must be apportioned to each copy produced. Therefore, the characteristics and costs associated with this type of product make it more competitive at these levels.

The Offset duplicating process is the most versatile of all the methods analyzed. It is capable of producing longer-run lengths per master, and copies of higher quality than any other method. This process also has the greatest flexibility in the type of workloads which it can accommodate. The Offset process is more aligned to the production of long-run lengths and heavy workloads; due to the above capabilities of the equipment and supplies, and the higher costs which must be allocated to its output.

TABLE 2

DUPLICATING EQUIPMENT IN THE MARKET

MANUFACTURER	MODEL	OPERATION	MAXIMUM SHEET SIZE	SPEED PER HOUR	TENDER COST ^a
<u>SPIRIT DUPLICATORS:</u>					
A.B. Dick Co.	215	Elec.	9" x 14"	6,000	\$ 274.50
Ditto Inc.	E-21	Elec.	9" x 14"	7,200	385.00
Heyer Inc.	76A	Elec.	9" x 15"	6,600	345.00
	86	Elec.	9" x 15"	6,600	400.00
Rotoprint	265	Elec.	9" x 15"	6,600	370.00 ^b
Dodwell	DE-2001	Elec.	9" x 15"	6,600	315.00
<u>STENCIL DUPLICATORS:</u>					
A.B. Dick Co.	550P	Elec.	9" x 15"	7,800	755.71
	530	Elec.	9" x 15"	7,500	669.53
Bohn-Rex Rotary	RR1000	Elec.	10" x 15"	3000-78000	733.00
Rotoprint	Geha 500	Elec.	9" x 15"	7,800	720.00
Roneo Inc.	Roneo 865	Elec.	10" x 15"	10,800	750.00 ^b
Gestetner	360	Elec.	10" x 15"	1800-10,800	829.50
<u>OFFSET DUPLICATORS:</u>					
<u>I</u>					
A.B. Dick Co.	324	Elec.	10" x 14"	N/A	1,671.40 ^b
Addressograph-					
Multigraph	85	Elec.	10" x 14"	5,400	1,767.45
Rotoprint	1075	Elec.	10" x 14"	N/A	1,985.00
Gestetner	200	Elec.	10" x 14"	N/A	2,400.00
<u>II</u>					
A.B. Dick Co.	350	Elec.	12" x 17"	4500-9000	3,307.69 ^b
Gestetner	201	Elec.	11" x 14"	N/A	3,420.00
Rotoprint	K270	Elec.	11" x 14"	N/A	3,640.00
Addressograph-Multi.	1250	Elec.	11" x 14"	9,000	4,310.75

^a These costs are derived from the 1970 Tenders, and they are the basis of the equipment costs presented in Table 16.

^b This model was awarded the tender for this particular process.

Source: "The New Duplicators: Easy Enough for Anyone", Administrative Management, January, 1970, p. 62, and the Edmonton Public School Board tenders for 1970.

COMPATIBILITY OF COPYING AND DUPLICATING PROCESSES

In this market there are both the copying and duplicating types of equipment present at each school location. These two methods of reproduction are also quite interdependent, because the copier is often used to produce masters for the duplicating process. However, due to the capabilities and limitations of the different copying and duplicating processes, they are not always compatible. For example, the Thermographic process is compatible with the Spirit and Stencil processes, since it can only copy onto the masters used in these processes [Table 1]. The Electrofax process is similarly related to the Offset duplicating process since it can only copy onto the type of master used in this process. The Dual-Spectrum process is completely restricted in this area, as it is unable to produce masters of any form, and thus must be used strictly for copying purposes. Therefore, the above interdependence indicates that the selection of a particular duplicating process will have an influence upon the type of copying equipment which is required.

THE XEROGRAPHIC PROCESS

The Xerographic process, like the Electrofax copying process, is based on the electrostatic principle. The process is initiated when a charge is applied to a photoconductive drum. This surface is then exposed to light reflected off the original which dissipates the charge in all areas, except those corresponding to the text of the document. This produces a latent image of the original. A black

powder with an opposite charge is then cascaded over the drum, and the particles adhere to the charged areas. Finally a sheet of ordinary paper is given a stronger charge than the drum and placed in contact with it. This causes the particles to transfer to the paper, which is then exposed to heat producing a permanent copy.¹⁰

The major advantage of the Xerographic process is that it is not restricted to copying onto sensitized materials. The process can produce copies onto cardstock, preprinted forms, letterhead, transparencies, offset masters, gummed labels, as well as various types and weights of papers. The copies are also permanent and are not sensitive to heat or light. The Xerox products, which have sole access to this process, also have automatic exposure adjustments. This enables them to produce copies from a wide variety of originals with no adjustments and minimal wastage.¹¹

However, the primary disadvantage of this process is that most types of Xerox equipment produce copies weak in contrast from continuous or half-tone originals. The copies of originals on colored paper stocks, or utilizing colored inks, may also vary in quality. This depends on the combination of the particular color, its degree of saturation, and the relative position of the color in the spectrum.¹²

The capabilities of the Xerox equipment are unique in

¹⁰ Donald Mason, Document Reproduction in Libraries (London: St. Ann's Press, 1968), p.49.

¹¹ William R. Hawken, Copying Methods Manual (Chicago: American Library Association, 1966), p. 148.

¹² Ibid., p. 122.

comparison to the existing copying and duplicating products in the market. The Xerox product line contains two basic categories of models. The first type represents equipment with the physical capabilities to accommodate only a copying workload; and are referred to as Copiers. The second category includes the products known as Copier/Duplicators, which can fulfill both copying and duplicating requirements in one piece of equipment [Table 3]. A comparison of the copying capabilities of both categories of Xerox equipment to those of the existing copying products in the market, illustrates that they will be fully competitive in this area [Table 1 and 3]. Similarly, the characteristics of the Xerox Copier/Duplicators compared to those of the duplicating equipment available in the market, illustrates that they are also more than competitive with respect to product capabilities [Table 2 and 3].

However, the cost structure related to the Xerox products is also unique to the existing market conditions. This equipment is supplied on a rental basis, rather than the outright purchase approach which has been adopted by this market. In general, the costs associated with this equipment include a rental charge, a meter charge for each copy produced, and paper and supplies costs. The rental charge varies with the different sizes and types of equipment involved. The meter cost for the Copiers is one rate, which is applied on a volume discount scale. The meter charge on the Copier/Duplicator equipment is made up of two separate rates. The first one is the copying rate, which is for copying up to 10 copies from one original; the second charge is the lower duplicating rate, which

TABLE 3

CHARACTERISTICS OF XEROX EQUIPMENT

MODEL	SINGLE(X) OR MULT. COPY TO	COPIES FROM BOUND BOOKS	MAKES OFFSET MASTERS	MAKES TRANS- PARENCIES	SPEED PER HOUR	AUTOMATIC EXPOSURE CONTROL	TENDER COST
813 Copier	10				420	X	Rental ^a
914 Copier	15	X	X	X	420	X	"
660 Copier/Duplicator	20				660	X	"
720 Copier/Duplicator	25	X	X	X	720	X	"
2400 Copier/Duplicator	499	X	X	X	2400	X	"
3600I Copier/Duplicator	499	X	X	X	3600	X	"
3600III Copier/Duplicator	499	X			3600	X	"
7000 Copier/Duplicator	499	X		X	3600	X	"

^a The pricing program for Xerox equipment is explained in more detail in Chapter Five.

Source: Xerox of Canada Limited.

applies to all work of over 10 copies of one document. All the equipment models also have a particular monthly minimum charge; consisting of the basic rental charge, and a minimum dollar level of meter charges. This is incurred whether the value of output exceeds this level or not.

Xerox has developed a special pricing program for this market which is referred to as the Education Pricing Plan. However, this plan is essentially only a slight modification of the pricing programs for all other markets. The only variations are that it uses an annual minimum charge instead of a monthly minimum rate, and that there is a 10 per cent discount from this amount. This in effect results in the elimination of the basic monthly rental charge to facilitate fluctuations in the volume of the requirements. The meter charges are exactly the same as those in other market segments. The more specific details of the Xerox pricing plans are provided in Chapter Five.

SUMMARY AND CONCLUSIONS

This analysis has considered the copying and duplicating processes and their products which are present in this market, and the relative capabilities and limitations of each. It has also evaluated the characteristics of the Xerox copying and duplicating products in relation to the existing equipment available. This study has determined that the Xerox products have a significant competitive advantage in being able to perform both copying and duplicating work with one machine. It has also indicated that the

only problem which the firm might have in obtaining product acceptance is due to its pricing policy, since this approach is quite different from the existing practices in the market.

CHAPTER III

CHARACTERISTICS OF THE MARKET

INTRODUCTION

This analysis provides an evaluation of the existing characteristics of the potential market segment, and its levels of demand for copying and duplicating equipment and supplies. The purpose of this study is to illustrate the current structure and competitive conditions which are present in this market, and the implications of these factors on its potential value for Xerox products. The analysis describes the size of the market, and the internal characteristics of the schools to illustrate its differentiated nature. It also evaluates the current levels of purchases of copying and duplicating equipment and supplies, and examines the functioning of the existing demand process.

MARKET SIZE

The market represented by the secondary schools within the Edmonton School District may be considered to be relatively large as well as heterogeneous in nature. The geographic area of the market is included within the electoral boundaries of the City of Edmonton. It contains two major segments; the Edmonton Public School Board, which includes all public schools in this area, and the Edmonton Separate School Board, which has control over the separate schools in this district. These two bodies will be referred to throughout the remainder of the study as the Public and Separate School Boards respectively.

Within the Public School Board there are 40 schools which provide the full junior high curriculum, as well as 13 senior high schools. The student population within these schools consists of 16,943 at the junior level and 17,189 at the senior high level.¹ The Separate School Board represents a smaller segment, in that it contains 26 schools which provide the full junior high curriculum, as well as 7 senior high schools. The student population within these schools is 7,365 at the junior level and 5,710 at the senior high level.²

AN ANALYSIS OF SCHOOL CHARACTERISTICS

The analysis of the nature and composition of secondary schools in The Edmonton School District indicates a variety of characteristics which have an influence on their copying and duplicating requirements. The factors hypothesized to have influence are; school population, selection of curriculum and its development, course scheduling, and teacher allocation. The following analysis illustrates that these characteristics vary among individual schools in the market. However, it also indicates that despite variations, the nature of the demand for these products is relatively constant throughout the different levels of the market.

¹ Superintendent's Report on Enrolment, The Edmonton Public School Board, September, 1969.

² Report on Enrolment, The Edmonton Separate School Board, January, 1970.

There is little consistency in the size of the student population at the individual school level in The Edmonton School District. Within both the junior and senior high school levels there are significant differences in the total population of each school. In the junior high schools these variations are the result of differences in enrolment demands, as well as limited capacities at some locations. The capacity limitation is due to the fact that the majority of these schools share the same facilities with the elementary level [Table 4 and 5]. In the senior high schools the population variations are basically a result of differences in enrolment demands at each location. However, this may be influenced by the presence of supplemental programs such as a vocational education department, or the use of a semester type of curriculum [Tables 6 and 7]. These differences in population could have a direct effect upon the volume of copying and duplicating work at individual schools.

Further variations exist between schools at the senior high level as a result of the different methods of course scheduling being utilized. Some schools use a semester program, however others have retained the traditional program in which individual courses are taught for the full school term [Tables 6 and 7]. These differences may produce slight variations in the volume and type of copying and duplicating workloads; due to the consolidation of course content, and use of different teaching methods in the semester program.

TABLE 4

EDMONTON PUBLIC SCHOOL BOARD

ANALYSIS OF JUNIOR HIGH SCHOOLS

Enrollment as of November 6, 1969

School	Elementary Total	Jr. High Total	School Total
Allendale	310	271	581
Avalon	-	608	608
Balwin	-	658	658
Britannia	-	627	627
Crestwood	251	171	422
Donnan	273	386	659
D. S. MacKenzie	249	263	512
Eastwood	345	247	605
Garneau	283	219	502
H. A. Gray	249	195	481
Hardisty	-	932	932
Highlands	-	572	572
Hillcrest	-	624	624
Kennilworth	158	512	670
Killarney	-	617	617
King Edward	407	283	690
Laurier Heights	524	290	814
Lawton	-	582	582
Londonderry	-	203	203
McCauley	154	260	414
McDougall	161	239	400
McKernan	291	272	563
Oliver	287	178	478
Ottewell	-	673	673
Parkallen	284	177	478
Parkdale	381	180	561
Parkview	416	326	760
Ritchie	74	480	554
Rosslyn	-	538	538
Sherbrooke	254	478	732
Spruce Avenue	277	175	471
Steele Heights	285	229	514
Stratford	-	585	585
Vernon Barford	-	563	563
Willington	-	771	771
Westglen	408	145	553
Westlawn	-	591	591
Westminster	-	543	543
Westmount	27	376	403

Source: "Superintendent's Report on Enrolment", The Edmonton Public School Board, November, 1969.

TABLE 5

EDMONTON SEPARATE SCHOOL BOARD
 ANALYSIS OF JUNIOR HIGH SCHOOLS
 Enrollment as of January, 1970

School	Elementary Total	Jr. High Total	School Total
St. Alphonsus	531	270	801
St. Andrew	252	96	348
St. Basil	480	190	670
St. Brendan	401	234	635
Cartier McGee	-	420	420
St. Catherine	226	156	382
St. Cecilia	-	732	732
St. Clare	240	121	361
St. Edmund	577	233	810
St. Francis	425	307	732
St. Gabriel	280	302	582
Holy Cross	190	430	620
St. James	249	171	420
St. Kevin	281	319	600
St. Leo	252	138	390
St. Mark	179	143	322
Mount Carmel	140	246	386
St. Nicholas	190	203	393
St. Patrick	352	141	493
St. Paul	182	91	273
St. Pius X	354	194	548
St. Rose	320	160	480
Sacred Heart	497	239	736
Sir John Thompson	-	285	285
St. Thomas More	-	566	566
St. Vincent	183	207	390

Source: "Report on Enrolment", The Edmonton Separate School Board,
 January, 1970.

TABLE 6

EDMONTON PUBLIC SCHOOL BOARD

ANALYSIS OF SENIOR HIGH SCHOOLS

as of September 1969

School	Enrollment	Semester or Non-Semester	Vocational Department Classes	Pupil Teacher Ratio
Bonnie Doon	1716	Non-Semester	51	22.1
Eastglen	1213	Non-Semester	39	19.3
Harry Ainlay	1522	Non-Semester	Voc. Dept.	18.4
Jasper Place	2391	Semester	Voc. Dept.	17.9
McKay Avenue	101		10	10.5
McNally	1370	Semester	43	19.6
M. E. Lazerte	245	Semester	9	19.5
Queen Elizabeth	1594	Combination	49	21.8
Ross Sheppard	2091	Non-Semester	70	21.5
Victoria	2668	Semester	Voc. Dept.	19.5
W.P. Wagner	949	Non-Semester	Voc. Dept.	18.5
Old Scona	456	Semester	38	11.3
Strathcona	1292	Non-Semester	12	42.6

Source: The Edmonton Public School Board.

TABLE 7

EDMONTON SEPARATE SCHOOL BOARD

ANALYSIS OF SENIOR HIGH SCHOOLS

as of January, 1970

School	Enrollment	Semester or Non-Semester	Vocational Department	Classes	Pupil Teacher Ratio
Archbishop McDonald	682	Non-Semester		23	21.2
Austin O'Brien	717	Non-Semester		34	22.5
O'Leary	1280	Non-Semester		43	19.3
St. Francis Xavier	552	Non-Semester		19	18.5
St. Joseph	1835	Semester	Voc. Dept.	61	22.6
St. Mary	772	Semester		24	20.1
Louis St. Laurent	180			6	18.6

Source: The Edmonton Separate School Board.

The individual schools at each level also vary with respect to their approach to the curriculum. They are being encouraged to become more oriented towards the needs, capabilities, and interests of the individual students. For example, control of The Department of Education of the Province of Alberta in the area of curriculum is limited to the selection of topics for the core subject areas.³ This allows the individual schools to have a certain degree of freedom in the development of the curriculum.

The results of this flexibility with respect to the curriculum are quite apparent throughout the market. For example, the schools are allowed to select the areas of the total curriculum which they will offer, particularly in the area of elective courses. This is because most schools lack the facilities to offer all the courses which are available. Some senior high schools also have the variation of providing vocational training in addition to the matriculation and business education patterns which are available in all schools at this level. At the junior high level, the structuring of elective courses is also left to the individual schools. This is to accommodate the variations in teaching resources and the student interests which exist at this level. Finally, the schools in both levels are allowed to use any teaching method or approach necessary to complete the learning function.

Therefore, there are differences in the courses, teaching

³ Province of Alberta, Department of Education, Junior High School Handbook, Edmonton: Queen's Printer for Alberta, 1968, p. 4.

methods, and course content being provided throughout the schools in the system. This results in the copying and duplicating requirements at individual schools being slightly different despite a common overall curriculum.

The allocation of teaching resources also varies within individual schools in the system. The number of teachers assigned to each school is based upon projections of future enrolment, and the pupil-teacher ratio is fairly similar at each location. However, the allocation of teaching resources within each school is influenced by such factors as the total staff available, and their particular areas of expertise. Therefore, the degree of teacher specialization varies among schools in the system. This factor influences the amount and type of duplicating required, since a teacher lecturing primarily in one subject area is likely to place more emphasis on the preparation of common sets of lecture materials.

There are also new developments being initiated within various schools in the market which cause them to be even further differentiated internally. Representatives from both the public and separate school boards have stated that individual schools have recently begun to implement new programs of teaching methods and administrative practices. However, these techniques have not been initiated uniformly throughout the system, and thus the more progressive schools are utilizing these practices while the remainder

follow more traditional methods.⁴ These programs involve different areas of teaching and administrative practices, as well as aspects of school size and structure which will be illustrated in more detail in Chapter Four. However, their presence in the more progressive schools further differentiates the schools within the total market.

This analysis of the internal characteristics of the secondary schools indicates that they are differentiated in many respects. The factors outlined above are considered to have an influence upon the copying and duplicating workloads in individual schools. Therefore, it is apparent that this study cannot assume complete consistency with respect to these requirements in schools throughout the market.

However, it is apparent that the above inconsistencies in school characteristics do not result in wide variations in the market demand. The individual schools within each level do not require vastly different types of copying and duplicating equipment to meet their particular needs. The market survey and cost analysis in Chapter Five illustrates that the equipment available have capacities which enable them to accommodate relatively wide variations in workloads with little change in the relative costs. Furthermore, the variations in the school characteristics, and their effect on the copying and duplicating workloads, has little influence on the demand

⁴ Interview with Dr. E. A. Mansfield, Director of Educational Research, Edmonton Public School Board, February 20, 1970. And a subsequent interview with Mr. J.L. Picard, Director of Educational Research, Edmonton Separate School Board, February 24, 1970.

for the various types of equipment which exist in the market. The differences in this demand are the result of decisions concerned with whether a more advanced process is worthy of the additional cost. Therefore, a certain level of consistency is present in the demand requirements among the schools at each level in this market.

CHARACTERISTICS OF THE MARKET DEMAND

The Purchasing Function

The purchase of copying and duplicating equipment and supplies in both school boards involves interactions between the individual schools, the school board administration, and the purchasing department. To illustrate this relationship, the procedure followed in the purchase of replacement equipment will be outlined. This process commences with a review by the administration of the annual requests from schools for the replacement of unsatisfactory equipment. It considers the age of the equipment involved, the repair expenses incurred, and the budgetary limitations; prior to determining the total number which may be replaced. The administration then makes a subjective evaluation of the schools involved regarding their type, size, and existing equipment. This results in a recommendation for a particular type of replacement for each location. This information is forwarded to the purchasing department for execution.

The purchasing department uses tenders for the procurement of this type of equipment. The tenders are issued annually and list the specifications for each item, and the projected requirements for this period. They stipulate that the suppliers may quote only on models

equivalent to equipment specifications. These prices must be maintained for one year in order that additional requirements beyond the tendered amount receive that price. The selection process for each item involves consideration of the degree to which the products meet the tender specifications and the prices quoted. The objective is to select the product with the lowest unit cost and comparable capabilities. Should there be new products introduced on the tenders, this department tests them to compare their characteristics in relation to the other products available in each category.

The above procedure varies only slightly in the purchase of equipment for new schools, and in the selection of copying and duplicating supplies. The purchasing of equipment for new locations involves a selection based on the budgetary allotment which has been made for this school, as well as the consideration of its type and projected size. In the purchase of copying and duplicating supplies, the only variation is that the majority of the responsibility for the selection rests with the purchasing department.

The marketing program of a firm with a new product must concentrate on two decision-making points in the purchasing process used in this market. The major area of concern is at the school board administration level, where the evaluation is made of school requirements and equipment capabilities in developing a specific purchase recommendation. It is critical that there is a complete understanding of the capabilities and advantages of the particular product at this level. Of slightly less importance is the approach to

the purchasing area. However, the firm must ensure that the product passes the initial testing and receives a favourable acceptance at this level.

The Nature Of The Market Demand

The analysis of the market demand is limited by the inability to secure proper data on the different types of consumption. There is information provided with respect to the purchases of copying and duplicating equipment for secondary schools. However, the only data available relating to the supplies consumption is the total annual usage of the Public School Board, and the total purchases by the Separate School Board. Due to these inconsistencies, the study analyzes the characteristics of the actual demand for copying and duplicating equipment in this segment, and those of the total market demand for supplies. This assumes that the characteristics of this overall demand approximate the nature of the demand in the secondary schools within it.

The analysis of copying and duplicating equipment purchases illustrates that the two segments of the market have slightly different purchasing patterns [Tables 8 and 9]. The Public School Board in 1970 purchased the thermographic type of copying equipment for approximately 90 per cent of its copying requirements; with the remainder being met by the electrostatic methods. In the duplicating area, it has acquired spirit duplicating equipment for approximately 70 per cent of its needs; the stencil process for 25 per cent, and the offset process for the remaining 5 per cent. The purchase of the

TABLE 8

COPYING AND DUPLICATING EQUIPMENT PURCHASES

IN 1969

1.	<u>Edmonton Public School Board</u>		
	(a) Copying Equipment	Unit Cost	Total Cost
	1 - Photofax Products Fordifax	\$240.00	\$ 240.00
	10 - 3-M Model 45C	379.15	3,791.50
	1 - 3-M Model 107	331.00	<u>331.00</u>
	TOTAL COST		\$4,362.50
	(b) Duplicating Equipment		
	5 - Heyer Spirit Manual Model 70	\$199.00	\$ 995.00
	1 - A B Dick Spirit Manual Model 210	183.75	183.75
	2 - Heyer Spirit Electric Model 76A	314.00	618.00
	3 - Gestetner Stencil Manual Model 330	420.00	1,260.00
	2 - Gestetner Electric Stencil & Scope Model 360	748.50	<u>1,497.00</u>
	TOTAL COST		\$4,553.75

TABLE 8 -- Continued

2.	<u>Edmonton Separate School Board</u>		
	(a) Copying Equipment		
	6 - 3M Model 45C	\$ 379.15	\$ 2,274.90
	1 - 3M Model 96	212.49	212.49
	3 - A B Dick Model 675	1,410.46	<u>4,231.38</u>
	TOTAL COST		6,718.77
	(b) Duplicating Equipment		
	17 - A B Dick Manual Spirit Model 210	183.75	3,123.75
	8 - A B Dick Electric	335.13	2,681.04
	1 - A B Dick Offset Model 360	4,817.55	4,817.55
	1 - Gestetner Offset Model 200	2,664.00	2,664.00
	2 - A B Dick Converters Model 120	216.00	423.00
	1 - A B Dick Converter Model 103	99.00	99.00
	1 - A B Dick Converter Model 110	125.00	<u>125.00</u>
	TOTAL COST		\$13,933.34

Source: The Edmonton Public School Board and The Edmonton Separate School Board.

TABLE 9
COPYING AND DUPLICATING EQUIPMENT PURCHASES
IN 1970

1. Edmonton Public School Board

(a) Copying Equipment	Unit Cost	Total Cost
4 - Gestetner Model TH-4	337.50	\$ 1,350.00
4 - 3M Model 107	331.66	1,326.64
1 - A B Dick Model 675	1,410.35	<u>1,410.35</u>
TOTAL COST		\$ 4,086.99

(b) Duplicating Equipment

8 - Dodwell Manual Spirit Model D3001	215.00	1,720.00
10 - Dodwell Electric Spirit Model DE2001	315.00	3,150.00 3,150.00
3 - Gestetner Manual Stencil Model 300	318.75	956.25
2 - Gestetner Electric Stencil Model 360	829.50	1,659.00
1 - A B Dick Offset Model 350	3,307.69	3,307.69
1 - A B Dick Offset Model 324	1,671.50	<u>1,671.50</u>
TOTAL COST		\$15,614.44

2. Edmonton Separate School Board

There have been no tenders issued for copying or duplicating equipment to date in 1970.

Source: The Edmonton Public School Board and The Edmonton Separate School Board.

electrostatic type of copying equipment and the offset duplicating products represents a minor shift from the purchasing patterns of previous years, as indicated in Chapter Four.

The Separate School Board incurred an inordinately high level of purchases for copying and duplicating equipment in 1969, and thus there were no tenders issued for these items this year. However, the 1969 purchases indicate that its pattern varies slightly from the previous segment. For example, it has acquired the thermographic type of copying equipment for approximately 70 per cent of its requirements, with the electrostatic method fulfilling the remaining 30 per cent. In the duplicating area it has only purchased two types of processes. The spirit duplicating method fulfilled 95 per cent of its equipment needs, and the offset process the remaining 5 per cent. This purchasing pattern illustrates the preference which has developed recently in this market segment for the combination of these two duplicating processes to accommodate the workloads at individual schools. This has also resulted in the minor shift towards the electrostatic type of copying equipment, due to its ability to produce offset masters efficiently.

An evaluation of the purchases of copying and duplicating supplies has illustrated a similar difference in patterns between the market segments [Tables 10 and 11]. The Public School Board expenditures on duplicating supplies, excluding paper, consist of approximately 45 per cent to each of the spirit and stencil supplies, and only 10 per cent for offset materials. However the Separate School

EDMONTON PUBLIC SCHOOL BOARD
 SUPPLIES USAGE SYSTEM FOR ALL
 SCHOOLS IN SYSTEM

	1969 Total Usage	Total Cost	1970 Usage To June 1	Total Cost
<u>Spirit Dupl. Supplies</u>				
Masters:				
Carbon Med. Run 8 1/2x11	346,800	\$ 6,519.84	383,200	\$ 7,204.16
8 1/2x14	117,600	2,563.68	134,200	2,925.56
Transofax Hecto 8 1/2x11	119,900	4,784.01	149,900	5,981.01
8 1/2x14	50,800	2,280.92	59,100	2,653.59
Total Cost		\$16,148.45		\$18,764.32
<u>Stencil Dupl. Supplies</u>				
Masters				
Stencil "E" W Pliofilm	72,672	\$ 5,603.01	88,992	\$ 6,861.28
Cestefax 100	3,312	1,334.74	3,696	1,489.49
Gestefax 200	5,040	1,028.16	4,512	920.45
Gestefax Thermal 400	1,100	231.00	3,100	651.00
Gestetner Ink	186	602.64	206	667.44
A.B. Dick Ink	3,268	8,660.20	3,765	9,977.25
Total Cost		\$17,459.75		\$20,566.91
<u>Offset Dupl. Supplies</u>				
Masters:				
5-4050 Med. Run	55,200	\$ 5,271.60	63,960	\$ 6,108.18
5-3050 Short Run	36,800	2,281.60	23,200	1,438.40
5-5053 Aluminium	4,024	816.88	4,024	816.88
Ink MLS 2100	5	11.25	6	13.50
MLS 2806D	18	33.30	11	20.35
Total Cost		\$ 8,414.63		\$ 8,397.31
<u>Mimeograph Paper</u>				
16 Lb. White 8 1/2x11	5.6 M	\$11,482.05	5.66 M	\$11,594.80
8 1/2x14	5.07M	13,435.50	4.32 M	11,448.00
		\$24,927.55		\$23,042.80
<u>Duplicating Paper</u>				
16 Lb. Bond White 8 1/2x11	14.63M	\$28,821.10	16.07M	\$31,655.93
8 1/2x14	5.26M	12,308.40	5.09M	11,903.58
Total Cost		\$41,129.50		\$43,559.51
<u>Copying Supplies</u>				
Thermographic 8 1/2x11	111,500	\$ 2,107.35	118,000	\$ 2,230.20
8 1/2x14	47,500	1,040.25	39,500	865.05
Total Cost		\$ 3,147.60		\$ 3,095.25
Total Usage		\$111,227.48		\$117,426.10

TABLE 11

EDMONTON SEPARATE SCHOOL BOARD

SUPPLIES PURCHASES FOR ALL

SCHOOLS IN SYSTEM

	1969	Total	1970	Total
	Purchases	Cost	Purchases To June 1	Cost
<u>Spirit Dupl. Supplies</u>				
Masters:				
Purple Med. Run 8 1/2x11	70,000	\$ 1,435.00	160,000	\$ 3,024.00
8 1/2x14	No Tender		40,000	896.00
Facsimilie				
Type 8 8 1/2x11	105,200	4,407.88	100,000	3,950.00
8 1/2x14	60,000	2,874.00	120,000	5,388.00
Total Cost		\$ 8,716.88		\$13,258.00
<u>Stencil Dupl. Supplies</u>				
Masters:				
Gestetner White	3,000	\$ 315.00	17,400	\$ 1,008.90
Gestetner #62.5	500	37.50	25,000	1,580.00
Gestefax #100	700	331.80	-----	-----
Gestefax #200	400	95.84	-----	-----
Gestefax Thermal #400	1,200	345.60	150	43.20
Total Cost		\$ 1,125.74		\$ 3,267.14
<u>Offset Dupl. Supplies</u>				
Masters:				
Roll Stock 6-1445	39	\$ 795.60	22	\$ 448.80
6-3033 Master	1,300	137.80		
Ink 3-1010C	18	49.50	14	38.50
A.B. Dick #3400	96	311.04	196	635.04
Total Cost		\$ 1,293.94		\$ 1,122.34
<u>Duplicating Paper</u>				
8 1/2 x 11	4.5 M	\$ 8,640.00	4.5 M	\$ 8,190.00
8 1/2 x 14	12.0 M	29,400.00	12.0 M	27,840.00
		\$38,040.00		\$36,030.00
<u>Mimeograph Paper</u>				
8 1/2 x 11	4.5 M	\$ 9,855.00	4.5 M	\$ 9,225.00
8 1/2 x 14	2.0 M	5,540.00	2.0 M	5,240.00
Total Cost		\$15,395.00		\$14,465.00
<u>Copying Supplies</u>				
Type 104 8 1/2 x 11	150	\$ 510.00	50	\$ 120.00
8 1/2 x 14	60	88.77	60	237.60
Electrostatic copy paper	3 rolls	48.00	6 rolls	84.00
Copier Toner		18.00	3 cases	54.00
Total Cost		\$ 435.52		\$ 495.60
Total Purchases		\$65,007.08		\$68,638.08

Source: The Edmonton Separate School Board.

Board incurred approximately 75 per cent of its duplicating expenditures on spirit supplies, with 20 per cent on stencil, and 5 per cent on offset materials. Both school boards continue to purchase primarily thermographic copying supplies with minimal amounts on electrostatic materials. The only apparent shift in the purchasing pattern in both segments is the increased consumption of masters which may be prepared by copying machines in all processes, which is due to their increased flexibility.

SUMMARY AND CONCLUSIONS

This analysis has described the existing characteristics of the market and its demand for copying and duplicating equipment and supplies. The evaluation has found that the schools in the market are differentiated in size and internal characteristics. However, it has indicated that this has little influence upon the demand for this equipment at each level, although it may have a direct impact upon the level of supplies consumed at each location.

The study of the characteristics of the market demand has illustrated that the firm must initially direct its marketing program to several key areas in the purchasing process if it is to achieve any level of penetration. It has also shown that the two segments cannot be considered as being completely homogeneous, since they have slightly different purchasing patterns and preferences in the selection of these products. Finally, this analysis has indicated that Xerox will have to overcome the strong preference which these

segments have for the processes which are economical, but limited in flexibility, such as the thermographic copying methods and the spirit duplicating process.

CHAPTER IV

PROJECTED DEVELOPMENTS IN THE MARKET

INTRODUCTION

In order to determine the potential of this market for Xerox copying and duplicating equipment, the analysis must consider projected changes in factors associated with the market, and their effect on its demand in the near future. Towards this end, an analysis will be made of the trends in teaching and administrative practices which are expected to be implemented the school systems in the near future, and the effect which they will have on the demand. Similarly, an evaluation will be made of projected changes in the market demand, and the size of the market structure, to provide a basis for projections of the extent of the future demand. A forecast of the expected market demand for the near future will then be made after considering the interaction of the above developments.

TRENDS IN SCHOOL CHARACTERISTICS

There have been new developments initiated recently in both segments of this market which are similar in character, and are currently being implemented in the more progressive schools in each system. These developments are related to school size and structure, as well as different areas of teaching and administrative practices. Officials of both school boards describe them as trends, and expect that in the near future all schools will adopt these practices. These factors will be evaluated in more detail in the following analysis.

The programs with regard to school size and structure are primarily directed at the junior high school level. The concept being implemented by both the public and separate school boards involves the establishment of separate facilities apart from other grade levels. This program includes both the construction of new facilities, and the separation of existing elementary-junior high schools to produce this configuration. These schools are being designed to accommodate a standard population of approximately 600 students.^{1,2}

A second development which is being implemented and is expected to be adopted throughout the market involves the more individualized preparation of lecture materials by teachers. In the schools where this has been adopted, particularly at the junior high level, there is less emphasis on the use of the traditional text books in the lectures. Instead, a form of programmed learning is being developed through the use of prepared sets of materials which are referred to as "unipaks". This method divides the course curriculum into topical areas, and the teachers use textbooks and reference information to prepare sets of material which are used in conjunction with a series of lectures. The unipaks are then

¹ Interview with Dr. E. A. Mansfield, Director of Educational Research, Edmonton Public School Board, February 20, 1970.

² Interview with Mr. J. L. Picard, Director of Educational Research, Edmonton Separate School Board, February 24, 1970.

duplicated and distributed to the students at the introduction to a new topic area in each course.^{3,4}

The unipak method of instruction has also influenced the examination techniques which are utilized in these schools. It has produced a shift away from regularly scheduled major examination periods. The approach used with this method consists of smaller, more repetitive review examinations which are typically held after the completion of a unipak in a particular course.

School Board Officials predict that the above practices produce a significant increase in the workloads of copying and duplicating equipment in individual schools, compared to the traditional techniques which are still dominant in the system.⁵ It may then be assumed that when these trends are implemented throughout both school systems, that the copying and duplicating requirements in the market will increase considerably.

PROJECTED CHANGES IN THE DEMAND FUNCTION

The only major change expected in the demand function in the near future relates to the purchasing process. Within the next two years both school boards plan to operate the schools as individual

³Interview with Dr. E.A. Mansfield, Director of Educational Research, Edmonton Public School Board, February 20, 1970.

⁴Interview with Mr. W. Cuthbertson, Principal of Vernon Barford Junior High School, March 2, 1970.

⁵Interview with Dr. E.A. Mansfield, Director of Educational Research, Edmonton Public School Board, March 6, 1970.

budget centers, with each given an annual budget for operating expenditures. The schools will have complete autonomy in the allocation of funds, and the role of the purchasing department will be to execute their orders, or provide advice as requested. This relationship will be a significant change in the roles which those two bodies currently fulfill. The individual schools will have the dominant influence in determining the type of copying and duplicating equipment purchased, as the decision-making process will shift to this level.

The decentralization of the decision-making authority to the individual schools is a most important development relating to the market potential, particularly from the viewpoint of Xerox. It will enable the firm to emphasize the greater convenience and flexibility of its products directly to the teachers who will make the purchasing decision for each school. This development will also reduce the emphasis placed on equipment and supplies costs by the centralized purchasing department, since there is likely to be an increased concern for teacher and student benefits. The Xerox products should be received very well at this level, since they offer increased benefits which will directly affect the teachers involved. This should provide the firm with the potential of an excellent competitive position in the market.

GROWTH IN THE MARKET STRUCTURE

The development of additional school facilities at the junior and senior high school levels is based upon projected increases in the student enrolment within both the public and separate school systems. The expansions are initially planned as each board analyzes the

projected enrolment growth in relation to the existing school capacities in different areas throughout its system. The physical structures which are necessary to meet these requirements are then developed.

In the past four years, the growth of student enrolment in both school systems has been rapid, and this has generated a relatively high rate of expansion in school locations. During this period the Public School Board has increased attendance 14 per cent at these levels, and the Separate School Board has risen 52 per cent [Table 12 and 13]. The expansion in school locations during this period has also been significant. As a result of this enrolment growth rate, the Public School Board has completed seven new schools and twelve additions, while the Separate School Board has completed six new schools and twelve additions [Table 14 and 15].

However, projections of future attendance levels by both school boards indicate a more restricted rate of growth in both the junior and senior high school levels in the near future. The Public School Board expects an overall increase of only 9 per cent while the Separate School Board predicts an increment of approximately 20 per cent in the next four years [Tables 12 and 13]. These levels are considerably lower than the previous growth rates, and thus the projected expansions in school locations during this period are below past levels. The Public School Board plans to construct twelve new schools and additions for two others in the next four years, which is a slight reduction from previous levels of expansion [Table 14]. The program of the Separate School Board has been limited even more in comparison; as it plans to

TABLE 12
EDMONTON PUBLIC SCHOOL BOARD
SECONDARY SCHOOL ENROLMENT 1965-75

School Year	Junior High Total	Senior High Total
1965-66	15,602	12,800
1966-67	16,291	13,610
1967-68	16,861	14,553
1968-69	16,763	16,254
1969-70	16,943	17,189
Projections:		
1970-71	17,330	18,155
1971-72	18,310	18,060
1972-73	18,865	18,340
1973-74	18,985	18,670
1974-75	19,100	19,745

Source: The Edmonton Public School Board

TABLE 13
EDMONTON SEPARATE SCHOOL BOARD
SECONDARY SCHOOL ENROLMENT 1965-75

School Year	Junior High Total	Senior High Total
1965-66	5,193	3,637
1966-67	6,170	4,022
1967-68	6,348	5,088
1968-69	6,656	5,813
1969-70	7,190	6,155
Projections:		
1970-71	7,457	6,600
1971-72	7,739	7,000
1972-73	8,112	7,315
1973-74	8,545	7,622
1974-75	8,799	8,040

Source: The Edmonton Separate School Board.

TABLE 14
EDMONTON PUBLIC SCHOOL BOARD
GROWTH IN SECONDARY SCHOOL LOCATIONS

1967-74					
School	Type	New School	Addition	Classrooms Provided	Completion Date
Parkview	J.H.		X	12	1967
D.S. Mackenzie	J.H.	X		24	1968
Steele Heights	J.H.	X		24	1968
Westlawn	J.H.	X		24	1968
W.P. Wagner	S.H.	X		34	1968
McNally	S.H.		X	14	1968
Ross Sheppard	S.H.		X	7	1968
Killarney	J.H.		X	8	1968
Avalon	J.H.		X	10	1968
Lawton	J.H.		X	8	1968
Londonderry	J.H.	X		24	1969
Balwin	J.H.		X	9	1969
Harry Ainlay	S.H.		X	20	1969
L.Y. Cairns	J.H.	X		15	1969
M.E. Lazerte	S.H.	X		60	1970
Queen Elizabeth	S.H.		X	5	1970
Jasper Place	S.H.		X	20	1970
Bonnie Doon	S.H.		X	8	1970
Westmount	J.H.		X	2	1970
Britannia	J.H.		X	6	1971
Vernon Barford	J.H.		X	8	1971
Riverbend	J.H.	X		24	1972
General Vanier	H.S.	X		40	1972
J. Percy Page	H.S.	X		65	1971
Hermitage	J.H.	X		24	1972
S.E.D.A.	J.H.	X		30	1972
Dickensfield	J.H.	X		16	1973
Clareview	J.H.	X		30	1973
Beverly	J.H.	X		30	1973
S.E.D.A.	H.S.	X		40	1973
B.A.C.M.	J.H.	X		24	1973
Clareview	H.S.	X		40	1974
Springfield	J.H.	X		24	1974

Source: "The Superintendent's Report on Accommodation,"
The Edmonton Public School Board, January, 1970.

TABLE 15
EDMONTON SEPARATE SCHOOL BOARD
GROWTH IN SECONDARY SCHOOL LOCATIONS

1967-72

School	Type	New School	Addition	Classrooms Provided	Completion Date
St. Joseph Vocational	H.S.	X		36	1967
Cartier-McGee	J.H.	X		9	1967
St. Brendan	J.H.		X	8	1967
St. Edmund	J.H.		X	12	1967
St. Gabriel	J.H.		X	4	1967
St. Thomas More	J.H.	X		18	1968
Sir John Thompson	J.H.	X		9	1968
Mount Carmel	J.H.		X	5	1968
Holy Cross	J.H.		X	4	1968
St. Cecelia	J.H.		X	11	1968
Austin O'Brien	S.H.		X	10	1968
Louis St. Laurent	S.H.	X		30	1969
St. Alphonsus	J.H.		X	5	1969
St. Francis	J.H.		X	7	1969
St. Francis Xavier	S.H.		X	7	1969
O'Leary	S.H.		X	11	1969
St. Vincent	J.H.		X	4	1969
J.J. Bowlen	J.H.	X		14	1970
St. Clare	J.H.		X	5	1971
Beriault	J.H.		X	6	1971
St. Mark	J.H.	X		20	1971
Dickensfield Area	J.H.	X		N/A	1972
Bonnie Doon	S.H.	X		N/A	1972

Source: The Edmonton Separate School Board.

complete three new schools, and additions to two others in its planning period which covers the next two years [Table 15].

From the above analysis it is quite apparent that the growth in the physical size of this market, and the locations within it will progress at a more moderate rate in the near future. Therefore, Xerox must expect that the vast majority of its penetration must come from the replacement of existing equipment at locations where there have been no physical changes to influence a demand for new equipment.

GROWTH IN THE MARKET DEMAND

The projected demand for copying and duplicating equipment in this market is expected to be similar to the levels of expenditures in previous years. The demand consists of purchases of equipment for new school facilities as well as for the replacement of equipment which has become obsolete or inadequate for changed requirements.⁶ Variations in the levels of this demand are closely related to the rate of growth in the school locations within the market.

An analysis of the previous expenditures for copying and duplicating equipment in both segments of the market indicates that the annual demand for these products has fluctuated widely from year to

⁶It has not been possible to develop projections of the demand for copying and duplicating supplies in this market. The school boards were not able to provide information on the levels of purchases of these materials prior to 1969. It was felt that this information was not sufficient to provide a basis for projections of future demand levels. The information which was available on the consumption of these supplies is provided in Tables 7 and 8 in Chapter III where it is used to illustrate the purchasing patterns in this market.

year [Table 16]. However, these changes have matched the variations in the levels of expansion in school facilities. For example, the major periods of expansion in locations within the Public School Board were 1968 and 1970. These periods correspond with the rapid increases in the levels of expenditures for these products in this market [Table 14]. Therefore this relationship, together with the projected downtrend in expansion of school locations in the near future, would indicate that declines in the levels of expenditures for this equipment may be expected in the near future. It would appear that future expenditures will be close to the 1969 level for the Public School Board and the 1968 level in the Separate School Board.

However, there are several factors which are expected to lift the demand for these products to levels somewhat higher than those indicated above. The initial factor is the presence of the trends in teaching and administrative practices outlined previously which will be implemented throughout the systems in the near future. It has been predicted that these methods will increase the level of usage at each location significantly. This is likely to generate additional demand, as the existing equipment in many schools may be inadequate for the changed requirements.

Similarly, the shift in the decision-making process for the purchase of this equipment to the individual school level should also increase the relative demand for this equipment. The teachers using the equipment will have a direct influence in the rate of replacement, and this should increase as they are likely to want the most efficient methods available. The above factors are very subjective and it is

TABLE 16

EXPENDITURES FOR COPYING AND DUPLICATING

EQUIPMENT 1967-70

TYPE OF EQUIPMENT	1970		1969		1968		1967	
	Quantity	Cost	Quantity	Cost	Quantity	Cost	Quantity	Cost
<u>EDMONTON PUBLIC SCHOOL BOARD</u>								
Spirit Duplicators	18	\$ 5,370.00	8	\$ 1,806.75	17	\$ 4,768.90	14	\$ 3,405.50
Stencil Duplicators	5	2,444.00	5	2,757.00	19	7,569.75	8	3,125.00
Offset Duplicators	2	4,979.09	-	-	-	1,895.00	-	-
Sub-Total		12,793.09		4,568.95		14,233.65		6,530.50
Copiers:								
Electrostatic	1	1,410.35	10					
Thermographic/Dual-Spectrum	8	2,676.64	12	4,501.65	7	2,654.05		-
Total Cost		16,860.08		9,065.40		16,887.70		6,530.50
<u>EDMONTON SEPARATE SCHOOL BOARD</u>								
Spirit Duplicators		-	17	3,259.35	2	452.73	13	3,353.30
Stencil Duplicators		-	8	2,681.04	2	1,191.00	5	2,150.40
Offset Duplicators		-	2	7,481.55	8	3,059.57	1	1,225.00
Sub-Total				13,421.94		4,703.30		6,728.70
Copiers:								
Electrostatic		-	3	4,229.92	-	-	-	-
Thermographic/Dual-Spectrum		-	7	2,614.05	7	2,642.05	4	1,280.70
Total Cost				\$20,265.91		\$ 7,165.35		\$ 8,009.40

Source: The Edmonton Public School Board and The Edmonton Separate School Board.

difficult to determine the precise value which they will add to the annual demand function. However, it is quite conceivable that their presence will raise the future demand slightly above the projected levels outlined above.

SUMMARY AND CONCLUSIONS

This chapter has provided an analysis of the projected changes in the market and their influence on the future demand for copying and duplicating equipment. It has illustrated that the demand for these products is closely related to the rate of expansion in school locations. Based on projected growth patterns in this area, it is apparent that the expected changes in the demand function and teaching practices in the market will lead to additional increases to this projection. Therefore, the demand for copying and duplicating products should increase slightly over the existing levels in the near future.

CHAPTER V

INTERNAL REQUIREMENTS OF THE MARKET

INTRODUCTION

In order to determine the potential of this market for Xerox copying and duplicating products, it is essential to consider the scope of the requirements at the individual locations in this market. To provide this information, a market survey was undertaken to determine the scope of the usage made of this equipment at various schools in the market. This information has been used in a cost analysis to determine whether the Xerox products can accommodate these workloads economically, and their competitive position with respect to other methods available in the market. Therefore, this analysis will illustrate the relative costs and capabilities of Xerox products under actual market conditions.

ANALYSIS OF THE REQUIREMENTS

The Survey Method

The market survey approach was used in this analysis due to the detailed characteristics of the information required. However, the unconventional nature of this type of information made it necessary to modify it from the format used in consumer-oriented studies. The development of the market survey followed the approach outlined by Philip Kotler which included the following areas of analysis; consideration of research objectives, development of research strategy, collection of data, and interpretation of the data.¹

Research Objectives

The objective of the study was to collect data which would determine the nature of the present and future demand for copying and duplicating equipment at individual schools in the secondary school system. The information required for such an analysis is quite diverse and detailed in nature. For example, in order to make cost comparisons between the various copying and duplicating methods, the following categories of information are required.

Copying Processes

- (a) The equipment costs.
- (b) The number of copies produced of each original.
- (c) The type of material on which the copy is produced.
- (d) The cost of materials used.

Duplicating Processes

- (a) The equipments costs.
- (b) The run length from each master.
- (c) The volume of duplicating prepared.
- (d) The cost of materials used.

Research Strategy

Survey Method

The nature and detail of the information requirements restricted

¹Philip Kotler, Marketing Management (Englewood Cliffs: Prentice-Hall Inc., 1967), p. 203.

the type of survey method which could be utilized. The technique selected involved the periodic use of a survey "log" since it was considered to be the most effective approach to the collection of this type of data. This method required the individual using the copying or duplicating equipment to record data on the survey logs which were placed at selected school locations. These information forms were designed to meet the information requirements previously outlined for both the copying and duplicating processes.

Sampling Plan

The size of the sample used in the survey was determined after considering the nature of the schools in the market, and the detailed information required from each location in the survey. Due to the time limitations and the above information requirements, the sample size was limited to six school locations. In conjunction with this decision, the internal composition of the sample was also determined. This was based on the consideration of the relationships between the number of junior and senior high schools in each segment of the market, and their total enrolments at each level. These factors indicated that the Public School Board was approximately twice the size of the Separate School Board, and that there was a similar relationship between the sizes of the secondary levels in each system. Therefore, it was concluded that the sample would be composed of two junior and two senior high schools under the jurisdiction of the Public School Board and one junior and one senior high school within the Separate School Board.

The sampling procedure was determined after considering the research objectives of the analysis as well as the nature and characteristics of the market. The method which was used in the selection of the schools for the survey sample was a nonprobability technique referred to as judgment sampling.² This method is based on the use of the "expert judgment" of a specialist in the subject matter of the survey who selects what he believes to be the most appropriate sample constituents, considering the objectives of the survey. Therefore this is not, nor is it intended to be, a probability sample.

The justification for the use of this method was that the survey was concerned with the requirements for copying and duplicating equipment under present, as well as future conditions. There were differences among individual schools with respect to the degree of implementation of new methods in teaching and administrative practices which were expected to be adopted throughout both school systems [Chapter Three]. It was felt that it would be difficult to determine the presence of such trends within individual schools from the external viewpoint of the researcher, due to their subjective nature. It was critical to the predictive value of the study to evaluate the requirements of schools containing these characteristics. Therefore, it was considered appropriate to base the sample selection on the recommendations of experts to ensure that the schools chosen contained the relevant trends. This approach was adopted since, the sample was not

²Harper W. Boyd Jr., and Ralph Westfall, Marketing Research (Homewood: Richard D. Irwin, Inc., 1957), p. 224.

required to be representative of the total market, but rather illustrative of these developments in the market.

The judgment sampling method utilized the expertise of the Directors of Research for the Public School Board and for the Separate School Board. These officials were given a full explanation of the research objectives of the study and the required composition of the survey sample. They were asked to consider the new developments being implemented in existing schools which they felt were representative of future developments in the structure and functioning of schools in the market. They were then requested to select schools in the market which had implemented these trends, following the guidelines of the required structure of the sample.^{3,4}

After a series of discussions, the following recommendations for the survey sample were put forward by the respective schools boards. At the junior high school level, the Public School Board recommended the Vernon Barford and Westlawn schools, and the Separate School Board selected the Sir Thomas Moore school. At the senior high school level, the Public School Board suggested Jasper Place Composite Composite High School and Queen Elizabeth Composite High School for the survey sample, and the Separate School Board selected Austin O'Brien Composite High School.

³ Interview with Dr. E. A. Mansfield, Director of Educational Research, Edmonton Public School Board, March 9, 1970.

⁴ Interview with Mr. J. L. Picard, Director of Educational Research, Edmonton Separate School Board, March 10, 1970.

Data Collection

The data collection was influenced by an awareness of fluctuations in copying and duplicating requirements caused by the various phases which exist in school curriculums. However, the extent to which the volume would vary, and changes develop in the other characteristics of the workload during these periods was unknown. At each school in the survey sample, the possible causes of the fluctuations and their approximate occurrences were discussed. It was found that typically the peak periods were several weeks prior to examination periods, and below-normal periods were encountered immediately following these periods and randomly at other times. The survey periods were scheduled to coincide with these different levels of workload in order that their characteristics could be measured. It was expected that an analysis made of the workload produced during these periods would provide information regarding the upper and lower limits of the volume of output as well as any particular requirements which might exist.

The survey was preceded by a test run at all locations in the sample in order to verify the ability of the logs to produce the required data. At this time all staff at each school was formally notified of the study by the principal, and their cooperation solicited. Therefore, this initial survey also served to familiarize the staff of the schools with the format and information required by the survey.

The data collection periods in the market survey were limited to a standard duration of five day periods. This period was selected in order to simulate a complete school week, and to ensure that the survey did not overlook any copying or duplicating functions which were restricted to particular times. This survey span was also considered to be sufficiently brief to avoid alienation by respondents, and produce a high response rate on the survey logs.

Analysis Of The Data

The data presented below represents the total recorded copying and duplicating usage at each location in the sample over three separate periods of measurement [Table 17]. From this information it is apparent that the total copying and duplicating workloads at the senior high schools are considerably greater than those at the junior high level in both market segments. Relating the survey data for each location to its student enrolment as outlined in Chapter 3 determines a second characteristic of the usage in this market. The copying and duplicating output per student varies between the two segments, with the levels in the separate schools being considerably greater than those measured in the public schools. Finally, an analysis of the survey data in relation to the structural characteristics of the sample schools as described in Chapter 3, indicates that these factors do not have a dominant influence upon the volume and type of copying and duplicating produced at the individual schools.

TABLE 17

MARKET SURVEY DATA COLLECTION

I. <u>QUEEN ELIZABETH COMPOSITE HIGH SCHOOL</u>	PRIOR TO EXAMINATION PERIOD	FOLLOWING EXAMINATION PERIOD	NORMAL PERIOD
A. <u>DUPLICATING OUTPUT:</u>			
Total Copies Produced	29,457	13,827	21,082
Total Masters - New	213	105	242
Used	36	54	51
Average Runlength	118	87	72
B. <u>COPYING OUTPUT</u>			
Total Masters Produced	64	35	82
Total Copies Produced	23	27	44
Total Transparencies Produced	2	3	-
II. <u>AUSTIN O'BRIEN COMPOSITE HIGH SCHOOL</u>			
A. <u>DUPLICATING OUTPUT</u>			
Total Copies Produced	30,668	18,617	20,041
Total Masters - New	270	238	261
Used	44	29	21
Average Runlength	98	70	77
B. <u>COPYING OUTPUT</u>			
Total Masters Produced	77	116	84
Total Copies Produced			
- Thermographic	31	28	57
- Electrostatic	119	208	164
Total Transparencies Produced	16	-	-

Source: Compiled from the market survey information sheets.

TABLE 17 -- Continued

69.

		PRIOR TO EXAMINATION PERIOD	FOLLOWING EXAMINATION PERIOD	NORMAL PERIOD
III.	<u>JASPER PLACE COMPOSITE HIGH SCHOOL</u>			
A.	<u>DUPLICATING OUTPUT</u>			
	Total Copies Produced	33,162	21,108	28,541
	Total Masters - New	389	234	257
	Used	94	5	87
	Average Runlength	57.3	67	68
B.	<u>COPYING OUTPUT</u>			
	Total Masters Produced	199	104	127
	Total Copies Produced			
	- Thermographic	-	-	-
	- Electrostatic	687	515	595
	Total Transparencies Produced	8	2	4
IV.	<u>SIR THOMAS MOORE JUNIOR HIGH SCHOOL</u>			
A.	<u>DUPLICATING OUTPUT</u>			
	Total Copies Produced	5,808	3,807	16,060
	Total Masters - New	86	74	236
	Used	3	5	4
	Average Runlength	65	48	67
B.	<u>COPYING OUTPUT</u>			
	Total Masters Produced	9	23	67
	Total Copies Produced	-	-	4
	Total Transparencies Produced	-	1	1

TABLE 17 -- Continued

70.

		PRIOR TO EXAMINATION PERIOD	FOLLOWING EXAMINATION PERIOD	NORMAL PERIOD
V.	<u>VERNON BARFORD JUNIOR HIGH SCHOOL</u>			
A.	<u>DUPLICATING OUTPUT</u>			
	Total Copies Produced	14,774	7,633	7,806
	Total Masters - New	194	121	99
	Used	15	-	4
	Average Runlength	67	63	76
B.	<u>COPYING OUTPUT</u>			
	Total Masters Produced	112	36	26
	Total Copies Produced	-	-	-
	Total Transparencies Produced	2	-	1
VI.	<u>WESTLAWN JUNIOR HIGH SCHOOL</u>			
A.	<u>DUPLICATING OUTPUT</u>			
	Total Copies Produced	12,785	7,157	9,514
	Total Masters - New	111	68	56
	Used	7	12	30
	Average Runlength	108	89	111
B.	<u>COPYING OUTPUT</u>			
	Total Masters Produced	75	94	22
	Total Copies Produced	47	40	8
	Total Transparencies Produced	1	-	1

Source: Compiled from the market survey information sheets.

A more detailed analysis of the survey data with respect to the copying requirements of this market indicates that the demand is severely limited in scope and volume. In the junior high level in particular, the requirements are low, since the copiers are typically used to prepare a limited number of stencil or spirit masters. At the senior high level the demand is more extensive, as it includes a much higher level of normal copying requirements, as well as the preparation of masters. There is little demand for the preparation of transparencies at either level in this market.

The survey data relating specifically to the duplicating requirements of the sample has indicated that there are relatively wide fluctuations in the levels of the volume and the average run length between the different periods measured. It also illustrates that there is no consistency in these aspects of the duplicating workload in the different schools in the sample; even when considered in proportion to the variations in their structural characteristics. Therefore there is little continuity on the duplicating requirements of the sample locations used in this analysis.

THE COST ANALYSIS

This analysis is based on the market survey data and determines the costs which would be incurred by the various copying and duplicating processes in accommodating these requirements. The cost factors associated with each process are evaluated in a method of cost analysis designed to determine the total costs involved for each

process. This determines the relative economies of the copying and duplicating methods, and illustrates the limitations of the Xerox approach in this area.

Cost Elements In Copying And Duplicating Processes

The cost elements related to copying or duplicating processes may be separated into three distinct categories; labour, supplies, and equipment costs. The labour cost relates to the time required to produce the copies in copying processes, or the time required for master preparation and production of the required material in duplicating processes. The supplies cost includes the variable materials consumed in the operation of both the copying and duplicating processes. The equipment category relates to the actual cost of the equipment, its planned rate of depreciation, as well as any relevant service and rental costs.

Method Of Cost Analysis

There have been two basic methods developed regarding the cost analysis of copying and duplicating processes. The first approach considers only those costs associated with the equipment and supplies, and differentiates costs according to their fixed or variable nature. This method is used by the offset, spirit, and stencil duplicating equipment manufacturers as well as other copying equipment companies for their comparative cost analyses. Its major limitation is the failure to consider the labour costs associated with these processes. The labour cost factor is a critical part of the total operating costs

for a particular duplicating process, and thus cannot be excluded from such an analysis.

A more realistic approach to the cost analysis area has been developed by the Xerox Corporation. This method includes a measurement of all of the above cost categories associated with a copying or duplicating process; labour, materials and equipment. It calculates a total cost for each of these factors over the period under analysis, and thus presents a more accurate outline of the actual costs involved. Therefore, this method is used to evaluate the various processes in relation to the market survey data.

Within the above cost analysis approach, there are three different methods of cost evaluation; the standard, actual expense, and average expense techniques of measurement. Each method is designed for use under different sets of circumstances. In this analysis the standard costing method is used, due to the inability of the market survey to determine the actual labour time required by the different processes in producing the workloads. This costing approach is unique in that it utilizes a measurement of "standard labour hours" in place of the actual operator labours needed to complete a particular copying or duplicating workload. The standards are derived from studies of the time required to complete the normal operator functions with different types of equipment, and at varying copying and duplicating workloads. These measurements provide the normal operator labour time which each duplicating process would require under the conditions found in the market survey.

Cost Analysis Of Duplicating Processes

The specific data required by the standard costing technique in order to compare the expenditures for various duplicating processes are as follows.

1. Volume of output
2. Total masters used
3. Equipment model and cost
4. Amortization policy or rental costs
5. Service expense
6. Supplies costs per copy
7. Meter costs
8. Operator labour costs.

The total duplicating cost for a particular process under a given set of conditions is determined from the above information base. This cost is calculated by first amortizing the fixed expense factors such as the equipment costs and service contract costs over the length of the period under analysis. The variable factors such as the costs for masters, supplies, and labour are then calculated by determining the unit cost and multiplying it by the total amount required during this period. The total duplicating cost for the period is the sum of the appropriate fixed and variable factors which have been expressed in these terms.

The data necessary to fulfill the above information requirements is derived from three separate sources. The information forms used in the market survey provide detailed information on the number

of masters used, the volume of output, and the average run length of the copies produced. The information relating to equipment, supplies and service costs may be obtained from the annual tenders of both school boards. Finally, the labour cost factor is determined through the calculation of the standard labour hours and this method is described in more detail in Appendix A.

Cost Factors Of Duplicating Processes

The specific cost factors associated with each duplicating process as required by the standard costing are enumerated in the following tables. However, there are several aspects of this information which require clarification. The equipment cost factor used in this analysis for the existing equipment and other duplicating methods is an average of the 1970 tender prices for equipment with equivalent capabilities. This approach is required since the selection is not based strictly on cost; but on other factors as well and thus, it would not be appropriate to base the analysis on the product with the lowest price. The existing types of equipment in the survey sample are outlined below in Table 18. A second area requiring clarification is the supplies costs for each process when alternative types of supplies are involved; such as the use of different types of masters. The unit cost used for these materials is based on the proportionate usage of each type as determined by the market survey.

Cost Analysis Of Copying Processes

The analysis of expenditures related to the various copying processes uses a more basic approach than the standard costing tech-

EXISTING COPYING AND DUPLICATING EQUIPMENT

JUNIOR HIGH SCHOOLS

SIR THOMAS MOORE 1 - A.B. Dick 210 Spirit Duplicator
 1 - A.B. Dick 525 Offset Duplicator
 1 - 3M Secretary Thermographic Copier

WESTLAWN 1 - A.B. Dick 215 Spirit Duplicator
 1 - Gestetner 310 Stencil Duplicator
 1 - 3M 96 Thermographic Copier

SENIOR HIGH SCHOOLS

JASPER PLACE 1 - A.B. Dick 215 Spirit Duplicator
 1 - Heyer 76 Spirit Duplicator
 1 - A.B. Dick 438 Stencil Duplicator
 1 - Gestetner 310 Stencil Duplicator
 1 - Addressograph-Multigraph 85 Offset Duplicator
 1 - 3M 96 Thermographic Copier
 1 - Olivetti-Underwood Copia II Electrostatic
 Copier

AUSTIN O'BRIEN 2 - A.B. Dick 210 Spirit Duplicators
 1 - Ditto E-20 Spirit Duplicator
 1 - A.B. Dick 530 Stencil Duplicator
 1 - Addressograph-Multigraph 85 Offset Duplicator
 1 - 3M Secretary Thermographic Copier
 1 - Apeco Super-Stat Electrostatic Copier

QUEEN ELIZABETH 1 - A.B. Dick 215 Spirit Duplicator
 1 - Heyer 76 Spirit Duplicator
 2 - Gestetner 360 Stencil Duplicators
 1 - 3M-107 Dual-Spectrum Copier
 1 - 3M Secretary Thermographic Copier

Source: The Edmonton Public School Board and the Edmonton Separate
 School Board.

TABLE 19

COST FACTORS OF THE SPIRIT DUPLICATING PROCESS

I.	Equipment Costs	
	Average Equipment cost for this category	\$348.00 ^a
II.	Rate of Depreciation - 5 years.	
	Service Expenses	
	There were no service contracts, and minimal expenses incurred.	
III.	Supplies Costs	
	Masters:	
	A. Direct Image -	
	Ditto Master medium coated Ofrex 8 ½ x 11	1.88¢/master
	Ditto Master medium coated Ofrex 8 ½ x 14	2.18¢/master
	B. Transfer -	
	Transofax Hectographic Stencil 8 ½ x 11	3.99¢/master
	Transofax Hectographic Stencil 8 ½ x 14	4.49¢/master

The market survey illustrated a ratio of 3:1 between the Direct Image and Transfer types and the sizes within each; therefore an average master cost of 2.5¢ was used.

Paper - assuming a 1:1 ratio between 11" and 14" .215¢/copy

Ditto Fluid .012¢/copy

Wastage Factor - a factor of 25% was applied to the supplies costs to account for wastage of supplies, and to the duplicator labour cost due to below standard machine productivity caused by the presence of unskilled operators.

^a Derived from an average of the equipment costs for this process as illustrated in Chapter Four.

Source: The data for Tables 19 to 22 has been derived from the Edmonton Public School Board and The Edmonton Separate School Board.

TABLE 20

COST FACTORS OF THE STENCIL DUPLICATING PROCESS

I.	Equipment Costs	
	Average equipment cost for this category	\$740.00 ^a
II.	Rate of depreciation - 5 years.	
III.	Service Expenses	
	There were no service contracts, and minimal expenses incurred.	
IV.	Supplies Costs	
	Masters:	
	A. Direct Image -	
	Gestafax #200 Carbon Stencils	20.4¢/master
	Gestafax #100 Vinyl Stencils	40.3¢/master
	Gestetner Ofrex Stencil	7.71¢/master
	B. Transfer -	
	Gestafax #400 Thermal Stencil	21.0¢/master

School board consumption records indicate that 90% of the masters used are of the Ofrex type, with the remaining 10% distributed evenly among the other types, therefore an average master cost of 9.57¢ was used.

Paper - assuming a 1:1 ratio between 11" x 14" sizes .215¢/copy

Ink - average price of \$2.95 per tube
with capacity of 7500 copies .039¢/copy

Miscellaneous Supplies .02 ¢/copy

Wastage Factor - A factor of 10% was applied to the supplies costs to account for wastage of supplies, and to the duplicator labour cost due to below standard machine productivity caused by the presence of unskilled operators.

^a Derived from an average of the equipment costs for this process as illustrated in Chapter Four.

TABLE 21

COST FACTORS OF THE OFFSET DUPLICATING PROCESS

I. Equipment Costs ^a	
A. Junior High Level	
Average equipment cost for this category	\$1,956.00
B. Senior High Level	
Average equipment cost for this category	\$3,670.00
II. Rate of Depreciation - 5 years.	
III. Service Expenses	
Category I	Service Contract - \$155.40 per year
Category II	Service Contract - \$235.80 per year
IV. Supplies Costs	
Masters:	
A. Direct Image	
Pin Bar 5-3020	6.20¢/master
Pin Bar 5-4020	9.55¢/master
Slotted 4000	9.55¢/master
B. Transfer	
Paper photographic 6-9023	22.52¢/master
Aluminium 6-6051	20.30¢/master
Aluminium Negative 6-6021	81.20¢/master
School board consumption records indicate that virtually all masters used are of the 5-4020 pin bar type, therefore an average cost per master of 9.55¢ was used.	
Paper - assuming a 1:1 ratio between 11" x 14"	.215¢/copy
Ink and Miscellaneous Supplies	.030¢/copy
Wastage Factor - A factor of 10% was applied to the supplies costs to account for wastage of supplies, and to the duplicator labour cost due to below standard machine productivity caused by the presence of unskilled operators.	

^a Derived from an average of the equipment costs for this process as illustrated in Chapter Four.

nique applied in evaluation of the duplicating methods. This is due to the lack of standard productivity rates for several copying processes used in this market. Furthermore, the inability of the survey to determine the labour time required by each process under various conditions eliminates the actual expense costing approach. Therefore, the factors which will be considered are the equipment and supplies expense, and an estimate of the labour time involved. This analysis compares the costs of these factors for different processes based upon the type and volume of workload produced.

Following the above approach, the specific cost information required to compare the expenditures associated with the various copying processes are listed below.

1. Equipment cost
2. Volume of output
3. Supplies costs
4. Amortization policy or rental cost
5. Meter cost
6. Service costs
7. Operator labour costs.

The data necessary to fulfill the above information requirements may be derived from the same sources used in the cost analysis of the duplicating processes. The market survey logs provide detailed information on the characteristics and size of the copying workload. The remaining information concerning the equipment and supplies costs is available from the annual tenders of both school boards. The specific

cost factors for each type of copying process are outlined in Table 22.

The calculation of the total cost for each process under a given set of conditions closely follows the technique used in the evaluation of the duplicating processes. The fixed expenses such as the equipment costs are amortized over the length of the period under analysis. The variable factors, such as the supplies and labour costs, are determined by multiplying their unit costs with the quantities required during the period. The total copying cost for each process consists of the sum of these two categories.

Cost Analysis Of Xerox Products

An Analysis is also made of the costs required by various Xerox products to produce the workloads outlined in the market survey. This is to determine the competitive position which these products would have in the market, based on the consideration of the cost factor. This evaluation also utilizes the standard costing technique. The factors involved in the analysis are the equipment, supplies, and labour costs. The equipment costs are determined by applying the two variations of the Xerox Education Pricing Plan to the workload requirements [Table 23]. The supplies costs are calculated by applying the unit costs of these materials to the output produced during the periods under analysis. The cost of the labour factor is determined by considering the standard labour hours required in each situation, according to the procedure outlined in Appendix A. The total cost proposed for

TABLE 22
COST FACTORS FOR COPYING PROCESSES

I. The Thermographic and Dual Spectrum Processes

A. Equipment Costs

Average equipment cost
for this category \$300.00^a

B. Rate of depreciation - 5 years

C. Service expenses

There were no service contracts, and
minimal expenses incurred.

D. Supplies Costs

(i) Paper -

3M 108 Thermographic 8½ x 11	1.89¢/sheet
3M 108 Thermographic 8½ x 14	2.19¢/sheet
Intermediate Type 655 8½ x 11	4.25¢/sheet
Copy Paper Type 607 8½ x 11	2.75¢/sheet

(ii) Transparencies

Type 628 Protection Transparencies 8½ x 10½	35¢/sheet
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II. The Electrostatic Process

A. Equipment Costs

Average equipment cost
for this category \$1,325.00

B. Rate of depreciation - 5 years.

C. Service expenses

There were no service contracts, and
minimal expenses incurred.

D. Supplies Costs

(i) Paper -

Roll Paper 8½" x 460'	\$14.00/roll
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(ii) Toner -

\$18.00/case

(iii) Master paper stock - 9" x 460'

20.40/roll

^a Derived from an average of the Equipment Costs for this process as illustrated in Chapter Four.

TABLE 23
XEROX OF CANADA LIMITED
EDUCATION PRICING PROGRAM

The Education Pricing Plan structures for the products considered appropriate to this market are the following.

Equipment	Annual Min. Charge	Min. After Discount	Pricing	
Xerox 2400	\$3600	\$3240	1-10 Copies/Original	Volume Discount Table
			10 and above	\$.007 each
Xerox 3600I	\$6000	\$5400	1-10 Copies/Original	Volume Discount Table
			10 and above	\$.007 each
Xerox 3600III	\$7200	\$6200	1-10 Copies/Original	Volume Discount Table
			10 and above	\$.007 each
Xerox 7000	\$7200	\$6200	1-10 Copies/Original	Volume Discount Table
			10 copies and above	\$.007 each

VOLUME DISCOUNT TABLE

Annual Number of Copies	Copy Rate
1 - 12,000	\$.060
12,001 - 36,000	.055
36,001 - 60,000	.050
60,001 - 144,000	.043
144,001 - 192,000	.037
192,001 - 240,000	.030
240,001 - 360,000	.024
360,001 - 600,000	.012
600,001 - +	.007

TABLE 23 -- Continued

THE DUPLICATING PRICING PLAN

The Duplicating Pricing Plan is a specialized pricing program which has been recently developed for other markets. This program has been modified to match the approach of this program and added to the Education Pricing Plan. It is only applicable to one Copier/Duplicator model and the pricing structure is as follows:

EQUIPMENT	ANNUAL MINIMUM CHARGE	NET MINIMUM CHARGE AFTER DISCOUNT	PRICING
36001	\$6,000	\$5,400	Initial charge for each run of \$.18 regardless of number of copies produced. Meter charge for every copy of \$.006 regardless of runlength.

Source: Xerox of Canada Limited.

the Xerox equipment in each situation is produced by calculating the sum of the above factors.

Evaluation Of The Cost Analysis

The cost analysis indicates that there is a wide divergence in the expenditures required by the various copying and duplicating processes to accommodate the workloads outlined in the market survey [Table 24]. It is also apparent that these relative cost rankings vary little in the three different measurement periods. This evaluation considers these costs, and the capabilities of each type of equipment in relation to the market needs in order to illustrate the methods of the various copying and duplicating processes available in this market presents the total cost for a particular duplicating process, and a compatible copying method. The study has previously indicated that each location in the market requires such a combination of equipment, and this form of presentation is for simplicity of analysis in this respect.

The analysis illustrates that the combination of the spirit duplicating and thermographic copying processes is the most economical alternative for accommodating the requirements at every location. A second advantage of this method is the simple operation of the equipment in the production of both copying and duplicating workloads. However, the School Boards must consider the limited capabilities of this equipment, as outlined in Chapter Two, in relation to the characteristics of the requirements in individual schools; to determine whether they

TABLE 24

MARKET SURVEY COST ANALYSIS

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TABLE 24 -- Continued

AUSTIN O'BRIEN COMPOSITE HIGH SCHOOL -- Continued				PERIOD I	PERIOD II	PERIOD III
c.	Offset Duplicating and Electrostatic Copier			\$ 173.96	\$ 124.81	\$ 128.71
d.	Xerox 3600I Copier/ Duplicator:					
	i. Education Pricing Plan			549.44	361.58	379.36
	ii. Duplicating Pricing Plan			461.53	294.39	311.95
III.						
JASPER PLACE COMPOSITE HIGH SCHOOL						
COPYING AND DUPLICATING OUTPUT:						
1.	Existing Equipment			219.34	142.76	178.32
2.	Proposed Costs for Other processes:					
a.	Spirit Duplicator and Thermographic Copier			163.23	107.44	144.06
b.	Stencil Duplicator and Thermographic or Dual- Spectrum Copier			221.37	137.99	177.25
c.	Offset Duplicator and Electrostatic Copier			218.14	145.22	179.59
d.	Xerox 3600I Copier/Duplicator:					
	i. Education Pricing Plan			679.83	412.95	558.79
	ii. Duplicating Pricing Plan			543.56	335.81	452.90

TABLE 24 -- Continued

IV.

SIR THOMAS MOORE
JUNIOR HIGH SCHOOL

COPYING AND DUPLICATING OUTPUT

1. Existing Equipment
2. Proposed Costs for Other Processes:
 - a. Spirit duplicator and Thermographic Copier
 - b. Stencil duplicator and Thermographic or Dual-Spectrum Copier
 - c. Offset duplicator and Electrostatic Copier
 - d. Xerox 2400 Copier/Duplicator:
 - i. Education Pricing Plan

	<u>PERIOD I</u>	<u>PERIOD II</u>	<u>PERIOD III</u>
	\$ 36.86	\$ 26.04	\$ 83.86
	28.24	20.35	74.93
	42.08	31.88	109.00
	43.21	35.47	97.34
	123.55	95.45	275.20

V.

VERNON BARFORD
JUNIOR HIGH SCHOOL

COPYING AND DUPLICATING OUTPUT:

1. Existing Equipment
2. Proposed Costs for Other Processes:
 - a. Spirit duplicator and Thermographic Copier
 - b. Stencil duplicator and Thermographic or Dual-Spectrum Copier
 - c. Offset duplicator and Electrostatic Copier
 - d. Xerox 2400 Copier/Duplicator:
 - i. Education Pricing Plan

	76.19	42.19	44.95
	70.85	37.06	36.39
	100.38	54.89	51.15
	97.69	57.63	55.27
	348.23	183.42	159.15

88
88.

TABLE 24 -- Continued

WESTLAWN JUNIOR HIGH SCHOOL		PERIOD I	PERIOD II	PERIOD III
COPYING AND DUPLICATING OUTPUT:				
1.	Existing Equipment	\$ 67.25	\$ 38.49	\$ 52.32
2.	Proposed Costs for Other Processes:			
a.	Spirit duplicator and Thermographic copier	54.34	33.56	41.66
b.	Stencil duplicator and Thermographic or Dual- Spectrum copier	75.64	45.49	56.88
c.	Offset duplicator and Electrostatic copier	74.99	49.45	58.55
d.	Xerox 2400 copier/Duplicator:			
	i. Education Pricing Plan	271.75	139.79	176.75

^a See Table 1.

^b Costs are based on the use of one machine of each type to accommodate the total workload.

can accomodate all aspects of the workloads. Therefore, despite these advantages, this method could be found to be incapable of fulfilling the total workload requirements at each location in the market.

The combination of the existing equipment present at each school location is consistently the second most economical alternative in the study. This equipment typically consists of a thermographic copier, as well as a spirit, and a stencil or offset duplicator [Table 18]. The combined capabilities of this equipment are sufficiently varied to enable it to meet most of the duplicating requirements which are likely to be present in this market [Chapter Two]. This approach allows the smaller workloads to be prepared by the spirit process, which is more convenient for these requirements. However, the limitations of this particular process restricts the variety of the output produced by this equipment, in comparison to other methods available.

The analysis also indicates that the combination of the thermographic copying and stencil duplicating process is slightly more expensive than the previous alternative in most situations. The capabilities of this equipment enable it to provide a better quality output, and accommodate more diverse requirements. However it requires more specialized operator knowledge than the above methods, which limits its accessibility. Therefore, this alternative must be evaluated with respect to whether these characteristics justify the higher costs required in this market.

The system of the electrostatic copying and offset duplicating process is the most expensive alternative which is currently available in the market; due to the higher cost of the copier required. However,

the advantages of this combination are the quality of the output and the versatility in the types of workload it can accomodate in both the copying and duplicating areas. Its only restriction is that the duplicating process requires highly-trained operators for it to be effective.

Finally, the cost analysis has indicated that the Xerox Copier/Duplicators are not competitive in this market under the existing pricing policies. The analysis of the relative product capabilities in Chapter Two indicated that this equipment is far superior to the above alternatives. For example, the quality of the output approaches that of the offset process. The equipment versatility is also greater than any other combination in the market, and the level of operator training required is far below any other method. However, the costs for these products are significantly higher than those for other processes in this market. It is apparent that a revised pricing program is required to enable the products to have a more competitive cost position in this market.

Therefore, there are three combinations of copying and duplicating processes which represent the major competitive forces in the market. These are the exisitng products which are present at each location; and the proposed systems combining the thermographic copying and stencil duplicating methods, or the elctrostatic copying and offset duplicating techniques. The Xerox Copier/Duplicator products have the physical capabilities to attain a dominant position in the market.

However, these characteristics are outweighed by a pricing program which is excessive, and prohibits the products from being a competitive factor in this market.

Proposed Xerox Pricing Program

The cost analysis of the market survey data has illustrated that the existing pricing programs for the Xerox equipment are inappropriate. They do not enable the firm to be in competitive cost position with respect to the other products in the market. This is primarily because both types of pricing plans in the education program are basically minor modifications of plans used in other markets. A pricing program is required for this market which takes into consideration the competitive costs and the peculiar characteristics of the usage of these products which exists.

The unique characteristics of this market are the level of costs associated with the competitive products, and the nature of the requirements in the individual schools. The costs for copying and duplicating equipment and supplies in this segment are much lower than in other markets. This is because the products are exempt from the Federal Sales Tax, and both school boards use the tender purchasing technique. Therefore, the costs associated with the Xerox products will have to be proportionately lower than those in other markets, in order to be competitive.

The market is also unique with respect to its copying and duplicating requirements. The senior high schools in particular

contain duplicating workloads with a number of very long-run lengths, which could not be produced for comparable costs on the existing Xerox products. Furthermore, the copying requirements in all schools consist of a relatively low volume made up of primarily single copies, and the production of copies onto duplicating masters.

Xerox should develop a pricing strategy which would take the above characteristics into consideration. For example, in the duplicating area the pricing program should be directed towards the lower run length situations. These requirements represent the vast majority of the workload at both the junior and senior high school locations. The pricing structure in the copies of each original, since the survey has indicated that there are not multiple copying requirements in this market. A program containing these basic characteristics is more consistent with the market requirements, and would place the firm in a better position with respect to other competitive factors.

The specific pricing program for Xerox products recommended by this study essentially implements the characteristics outlined above. It retains the concepts of no monthly rentals, and annual minimum charges which are present in the existing program. However, in the copying phase there should be lower meter charges on the volume discount scale, to make it more competitive with the costs of other copying processes [Table 25]. The present copying range on the Education Pricing Plan should also be reduced to include only from one to three copies of an original. This would match it more closely with

TABLE 25
PROPOSED EDUCATION PRICING PLAN
FOR XEROX OF CANADA LIMITED

Equipment	Annual Min. Charge	Min. After Discount ^a	Pricing Program ^b	
Xerox 2400	\$3600	\$3240	1-3 Copies/Original	Volume Discount Table
			4 and above	\$.005 each.
Xerox 3600I	\$6000	\$5400	1-3 Copies/Original	Volume Discount Table
			4 and above	\$.005 each.
Xerox 3600III	\$7200	\$6200	1-3 Copies/Original	Volume Discount Table
			4 and above	\$.005 each.
Xerox 7000	\$7200	\$6200	1-3 Copies/Original	Volume Discount Table
			4 and above	\$.005 each.

VOLUME DISCOUNT TABLE

<u>Annual Number of Copies</u>	<u>Copy Rate</u>
1 - 12,000	\$.045
12,001 - 36,000	.040
36,001 - 60,000	.035
60,001 - 144,000	.030
144,001 - 192,000	.025

^a There is a ten per cent discount allowed from the Annual Minimum charge.

^b This plan has been applied to the usage requirements at two locations to illustrate its relative costs. At Austin O'Brien High School the costs under this program for the three periods would be; \$278.83, \$178.67, and \$199.00 respectively. At Vernon Barford Junior High School, the costs would be; \$140.28, \$73.82, and \$72.86 for the three periods. These price levels are far more competitive than the existing costs.

the market requirements, and also eliminate the high set-up costs for the short-run duplicating workloads which are predominant in the market. The span of the existing copying range makes the costs for these workloads prohibitive, regardless of the duplicating charges applied. In the duplicating area, the meter charge should also be reduced slightly to make it more competitive with the costs associated with other processes [Table 25]. Finally, the concept of the Duplicating Pricing Plan should be discontinued, since its program of meter charges does not enable the equipment to meet the copying requirements of the market.

The above proposal would place the firm in more direct competition with the costs of other processes in the market. It is intended to be used as an initial pricing plan which would enable Xerox to evaluate the product acceptance, and the emphasis being placed on costs in the market, while being at a relatively competitive level in this respect. These prices are above the current market level, however this strategy provides the alternative of reducing them farther if it is required due to competitive conditions. From the previous analysis, it would appear that this cost position is not of critical concern, since the shift in the decision-making process to the individual schools will remove some of the emphasis on costs. This will replace with a consideration of equipment capabilities with respect to teacher and student benefits. It has been indicated that the Xerox products have the characteristics required in this area, and

with the more competitive nature of the above pricing plan, the products should be able to gain acceptance in this market.

It is apparent that this proposal must be further analyzed with respect to the overall revenue it would provide, the costs involved, and the minimum rate of return which the firm requires from such programs. Unfortunately this study lacks the information required for such an analysis, and therefore its proposals in this area must be prefaced with these limitations. However, this analysis has indicated that the level of this pricing program approximates the maximum revenue which Xerox could expect to obtain, while retaining a sufficiently competitive cost position to enable full penetration of the market.

SUMMARY AND CONCLUSIONS

This analysis has outlined the unique characteristics of the present and future demand for copying and duplicating equipment at selected school locations in this market. This data has been used as the basis for a cost analysis to consider the relative value of the different copying and duplicating methods. It has illustrated that the existing pricing programs for the Xerox products are inappropriate for this market, and are the major restriction to product acceptance. An alternative pricing policy has been developed which would make the firm more competitive; considering the other cost factors, and the criteria which will be used in the selection of these products in the near future.

CHAPTER VI

SUMMARY AND CONCLUSIONS

INTRODUCTION

This phase of the market analysis will consider the conclusions and recommendations which have been developed in each phase of the study, and evaluate their implications with respect to the overall potential of the market. Following this analysis, an outline of the areas of the market and the firm's approach to it which require further analysis prior to the firm being in a position to arrive at a final commitment will be presented. The study will conclude with a description of the benefit which the market analysis technique provides to the individual firm.

THE MARKET POTENTIAL

The analysis of this regional market segment has indicated that the potential of the market demand for all copying and duplicating equipment in secondary schools is relatively positive. The demand for these products has been found to closely match the changes in the level of expansion of the physical size of the market and the locations within it. The projected growth in this area in the near future is expected to decline from recent levels. The rate of this decline would indicate that the total demand for these products may be expected to fall to the levels of recent years in the near future.

However, there are other factors present which are expected to

have a further influence on the overall demand. The implementation of the trends in teaching and administrative practices throughout the school systems in the near future may generate additional demand. This is because the existing equipment in many schools may be inadequate for the increased requirements. The shift in the decision-making process for the purchase of this equipment to the individual school level should also increase the relative demand. The schools are likely to place a higher value on more efficient and flexible equipment than the existing purchasing body. These two factors are very subjective, and the value which they will add to the overall demand is not clear. However, the net result is expected to be a level of demand for these products in the near future which is slightly higher than the current levels.

MARKET POTENTIAL FOR XEROX PRODUCTS

Considering the moderate growth expected in the total market demand for copying and duplicating equipment, the potential of the Xerox products in this market is good, if the firm makes several adjustments in its approach. Due to this slow rate of growth in the market, the vast majority of the Xerox penetration must come from the replacement of existing equipment at locations which have had no physical change to influence the demand for new equipment. Therefore, these products will have to offer significant competitive advantages in this market to achieve this goal.

The analysis of the relative product capabilities of equipment currently in the market indicates that the Xerox products have several

distinct advantages in this area. The Copier/Duplicator models, which are best suited to this market, provide the unique capability of being able to accommodate both types of workloads in one machine which does not require a skilled operator. These capabilities, in addition to the other advantages which are inherent in the process, will enable the firm to be more than competitive in this market.

The impact of these product capabilities will be increased due to the decentralization of the decision-making process for the purchase of this equipment. This development will enable Xerox to stress its major competitive advantages directly to the teachers making these decisions; and they will benefit most from the capabilities of these products. Furthermore, the criteria of the selection process at this level will place less emphasis on cost factors, and increase the concern for student and teacher benefits.

However, the major restriction to the penetration of the market by these products is their existing pricing programs. A new approach to this area is required which would take into consideration the peculiar characteristics of the usage in this market, as well as the level of the competitive costs for equipment and supplies. Until a pricing policy is developed which places these products in a more competitive position to the other processes available in the market, the potential of the market for these products will continue to be at an extremely low level.

FACTORS REQUIRING MORE DETAILED ANALYSIS

The value of the market analysis technique is that its evaluation illustrates characteristics of the market, or the firm's approach to it, which require more detailed analysis. In this particular study the information provided by the market analysis indicates that the market strategy of the firm, and its product pricing policies require further evaluation. Therefore, the particular aspects within these two areas which should be considered by the firm prior to making a decision on this market are enumerated below.

Market Strategy

The analysis has indicated that there will be major changes implemented in the purchasing area of the market demand in the near future. The development of primary concern will see the individual schools established as budget centers and given financial autonomy within the limits of an annual operating budget. This program will result in the responsibility for purchasing decisions relating to this type of equipment being shifted to the individual school level. Therefore, the firm should develop a marketing strategy which will accommodate this trend in the market segment.

There are several factors which Xerox should evaluate with regards to including them in the overall market strategy. It should initially consider the value of adopting a total vertical marketing approach to this particular segment. This would basically involve the use of a specialized sales force which would be completely knowledgeable about the teaching and administrative practices which impinge upon the

use of this equipment. This level of knowledge in the field force could be critical since the school staffs will become involved in the decision-making process relating to the selection of this equipment.

Somewhat related to the vertical marketing approach is the development of marketing support materials for this segment. These must be oriented to the interests and concerns of the teachers and principals of individual schools which will become involved in these decisions. This material must be designed to complement the overall strategy and the market knowledge of the sales force.

Pricing Program

The market analysis has indicated another area which requires further evaluation by the firm. This refers to the development of an acceptable pricing program for this market. The market survey, and the accompanying cost analysis, have illustrated that the existing pricing programs are inappropriate. This is primarily due to the fact that the pricing plans in the education program are basically modifications of plans used in other markets. The market analysis has indicated that a new approach is required which will take into consideration the competitive costs, and the peculiar characteristics of these products in this market.

The above factors make it apparent that Xerox should give consideration to the type of pricing plan which has been proposed in Chapter Five. Such a plan would be more consistent with the market requirements, and would place the firm in a much better position in

relation to other competitive factors. Xerox should evaluate the degree of profitability which it would derive from the market with this pricing plan in relation to that of other segments. This is because it is judged that the Proposed Education Pricing Plan is likely the highest level of prices which the firm could charge in this market and retain a competitive position.

THE VALUE OF THE MARKET ANALYSIS METHOD

The market analysis technique, through its evaluation of primary and secondary data sources, considers the external factors in a market which can affect the sale of the products of a firm. This study has illustrated that the value of this method is that it provides a description of the market, and its analysis enumerates areas for more detailed analysis prior to the firm developing a rigid market strategy. For example, the market analysis has indicated that due to the particular characteristics and trends within this regional market, the firm's strategy and product pricing programs must be re-evaluated. Therefore, this technique provides an initial check against the failure of a product in a market, and outlines the fundamental problem areas involved. It is also apparent from this study that the market analysis technique could be applied in the initial evaluation of markets in many fields. The scope of this type of analysis is broad enough, and the techniques used are of such a general nature, that it could be implemented by any type of firm which is considering an expansion into a new market.

SELECTED BIBLIOGRAPHY

BOOKS

- Alevizos, John P. Marketing Research. Englewood Cliffs: Prentice-Hall Inc., 1961.
- Barksdale, Hiram C., and Weilbacher, William M. Marketing Research. New York: The Ronald Press Co., 1966.
- Boyd, Harper W. Jr., and Westfall, Ralph. Marketing Research. Homewood: Richard D. Irwin Inc., 1967.
- Brown, Lyndon O., and Beik, Leland L. Marketing Research and Analysis. New York: The Ronald Press Co., 1969.
- Crisp, Richard D. Marketing Research. New York: McGraw-Hill Inc., 1957.
- Hawken, William R. Copying Methods Manual. Chicago: American Library Association, 1966.
- King, William A. Quantitative Analysis for Marketing Management. New York: McGraw-Hill Inc., 1967.
- Kotler, Philip. Marketing Management. Englewood Cliffs: Prentice-Hall Inc., 1967.
- Luck, David J.; Wales, Hugh G.; and Taylor, Donald A. Marketing Research. Englewood Cliffs: Prentice-Hall Inc., 1961.
- Mason, Donald. Document Reproduction in Libraries. London: St. Ann's Press, 1968.
- Pargeter, Philip S. The Reproduction of Catalogue Cards. London: Staples Printers Ltd., 1960.
- Province of Alberta, Department of Education. Junior High School Handbook. Edmonton: Queen's Printer for Alberta, 1968.

Verry, H.R. Document Copying and Reproduction. London: Fountain Press Ltd., 1960.

ARTICLES

"Copier '70: New Processes and Capabilities." Administrative Management, December, 1969, p. 48.

"The New Duplicators: Easy Enough for Anyone." Administrative Management, January, 1970, p. 62.

UNPUBLISHED MATERIALS

Luck, G.H. "Accommodation Report and Building Program - 1970,"
The Edmonton Public School Board, February 3, 1970.

"Superintendent's Report on Enrolment," The Edmonton Public School Board, November, 1969.

"Report on Enrolment," The Edmonton Separate School Board, January, 1970.

INTERVIEWS

Interview with Dr. E.A. Mansfield, Director of Educational Research,
The Edmonton Public School Board, February 20, 1970.

Interview with Mr. J.L. Picard, Director of Educational Research,
The Edmonton Separate School Board, February 24, 1970.

Interview with Mr. W. Cuthbertson, Principal of Vernon Barford
Junior High School, March 2, 1970.

Interview with Dr. E.A. Mansfield, Director of Educational Research,
The Edmonton Public School Board, March 6, 1970.

Interview with Mr. J.L. Picard, Director of Educational Research,
The Edmonton Separate School Board, March 9, 1970.

APPENDIX A

THE CALCULATION OF STANDARD LABOUR COSTS

The standard labour time requirements for the duplicating operations vary with the presence of different factors. The time requirements depend upon; the number of masters used, average run length of the copies produced, total volume of output, and equipment capabilities. The determination of the standard hours required for each set of conditions involves several calculations. The average run length is first derived by dividing the total output produced by the number of masters used. This information is then applied to the following formula:

$$Y = \frac{100 \quad M}{MX + B}$$

Y = copies per hour

M = Average runlength

X = Standard hours per
100 copies

B = Standard hours per
100 originals

The information concerning the standard hours for the originals and copies is derived from tables prepared for the various models of duplicators. This determines the output of a particular duplicator for each set of conditions in copies per hour. This level of productivity is divided into the total volume produced during the period measured, to calculate the standard labour time required in each situation. This time requirement is then multiplied by an appropriate wage rate [\$3.00 per hour including burden and fringe

costs] to determine the labour cost; which is then included in the calculation of the total duplicating cost.

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